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COMBINED EFFECTS OF BALLISTICS INJURY AND BLOOD LOSS

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To study the combined effects of a ballistic injury and hemorrhage, we have used 5 experimental groups : anesthetized (A), anesthetized and ballistic injury (AI), anesthetized and bled (AB), anesthetized, ballistic injury, and bled (AIB), and conscious bled (CB). The model is the splenectomized, 90kg Large White Pig. The hemorrhage volume was 15ml/kg removed over a one hour period. The ballistic injury was given just before the hemorrhage, and only involves the soft tissue of the posterior thigh. The animals were chronically instrumented for the measurement of physiological parameters (heart rate, arterial and central venous pressures, and renal artery and aortic flows), hematology, and biochemistries. The ballistic injury only provoked a significant and lasting drop in CVP in the anesthetized animals. The combination injury and hemorrhage modified the cardiac responses to hemorrhage by favoring the inotropic responses more

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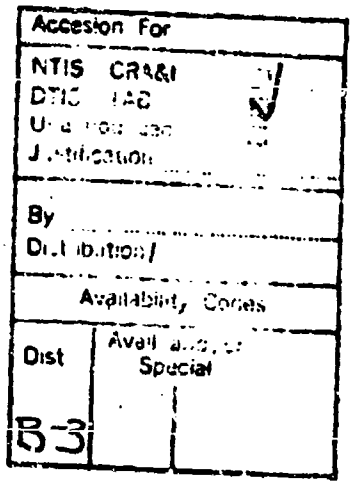
than chronotropic response that was seen. The classic hemorrhage model does not therefore exactly represent the hemorrhage received in combat which is generally associated with a ballistic injury.



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COMBINED EFFECTS OF BALLISTICS INJURY AND BLOOD LOSS

I- INTRODUCTION

Recent studies suggest that a variety of factors may impact on the physiological and biochemical responses to and survival following a major hemorrhage. For example, in response to removal of a fixed volume of blood, animals bled in a holding cage had a higher survival rate than those bled in a Pavlov sling (6). This simple change in handling procedure drastically changed the outcome. In addition, it has been found that the hemodynamic and biochemical responses during recovery from blood loss are altered by the addition of sciatic nerve stimulation as a nociceptive input, showing that possible nervous system involvement from injury can modify the homeostatic reflexes to hemorrhage (18).

A high velocity shot in the thigh of an anesthetized pig induces a high frequency, high amplitude pressure wave. This wave is not restricted to the injury area, but can be recorded throughout the body and induces structural changes in the sciatic nerve and even in the central nervous system (22, 9).

These findings raise questions of the applicability of information obtained from pure hemorrhage animal models to the understanding of what happens to the military trauma victim, who would likely have ballistic injury plus hemorrhage. Almoskog (1) studied the effects of hypovolemia on local missile injury, but he did not study the opposite question, how does local missil injury affect the responses to hypovolemia? Therefore, our study was designed to characterize the physiological responses involved in the combination of a realistic battlefield ballistic injury with a fixed-volume hemorrhage. This information should help us more fully understand the applicability of animal models to combat casualty care.

Hemorrhage model:

Previous studies demonstrated that the domestic pig is superior to the dog or sheep as a large animal model of hemorrhagic hypotension

(23, 7, 12). Functional characteristics of the porcine cardiovascular system and the pig's hemodynamic responses to hemorrhage more closely resemble those of the human than do other animal models (14, 28). Moreover, an animal with sufficiently large-sized muscle mass is required in order to perform the the type of ballistic, soft tissue injury utilized in this study. The Large-white pig, weighing approximately 90 kg meets this muscle mass requirement.

It is necessary to splenectomize the pig, because the pig has a large contractile spleen which Hannon and al (11) showed is capable of storing a large volume of red blood cells which can be released in response to hemorrhage. The splenectomized pig has responses to hemorrhage that are remarkably similar to those reported for adult humans (13).

The fixed-volume hemorrhage model seems to simulate the hemorrhage seen in combat casualties better than the Wiggers fixed-pressure hemorrhage model (10). Also, recent experiments have demonstrated that blood loss produced by aortotomy results in a more hypotensive response than that expected by the loss of a similar volume of blood in the fixed-volume phlebotomy model (3). This is another indication that injury plus blood loss alters the responses in the combat casualty.

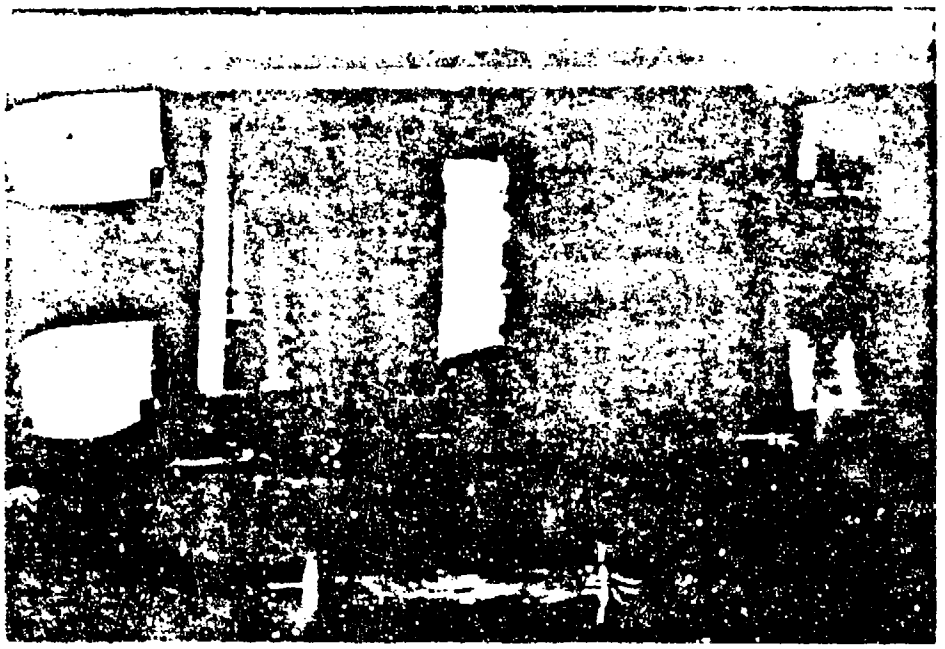
II- METHODS

Surgical preparation:

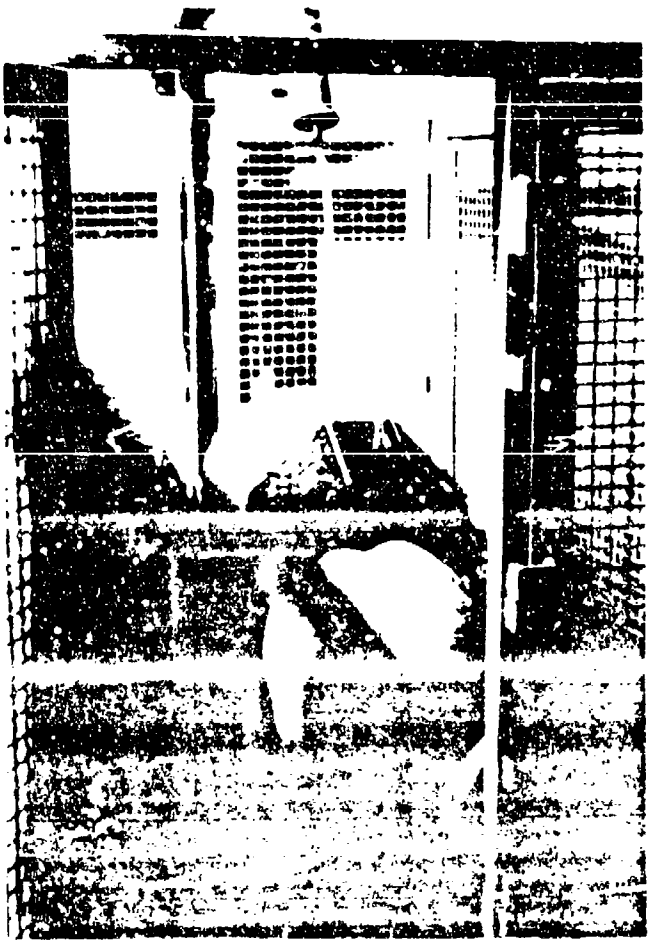
Thirty-eight female Large-white pigs (obtained from a commercial swine farm) were used in this study. They underwent three operations. The animals were fasted 24 hours before each surgery with water available ad libidum. On the morning of surgery, they were pre-medicated with ketamine (30 mg/kg), acepromazine (2 mg/kg) and atropine (0,05 mg/kg). An intravenous infusion of saline (0,9 % NaCl) was begun and the animals were intubated. For major surgery, 0,5% - 1.0% halothane was administered with 20% O2 and 80% N2O, with a Minerve respirator. All surgery was performed using aseptic techniques.

The three surgeries were as follows : 1) Six weeks before the experiment, the spleen was removed via a left posterior lateral hypochondral laparotomy.
2) Two weeks before the experiment, we chronically implanted a renal flow probe, catheters and EKG electrodes. The electromagnetic flow probe (4 mm, Spectramed) was placed around the left renal artery via a retroperitoneal incision. Two silicon catheters (Silastic N°602 25; Dow Corning) were inserted non-occlusively; one was inserted into the left carotid artery to be used for taking blood samples, and the other into the left external jugular vein and advanced to the right atrium to be used for measuring central venous pressure (Statham transducer - Spectramed). Three EKG leads (spiral of steel wire on silastic patch) were placed subcutanously in the middle of the right and left chest and on the back and attached to the musculature. 3) One week before the experiment, we performed a left thoracotomy and an electromagnetic blood flow transducer (20 mm - Spectramed) was placed around the aortic root. A pressure transducer (Koenigsberg Instrument) was also placed into the aortic root. A strain gauge embedded in silastic (Medical Adhesive Silicon - Dow Corning) was sutured onto the left ventricular myocardium.
Finally, a large-bore silastic catheter (n° 602 405, Dow Corning), through which the hemorrhage was performed, was sutured non-occlusively into the aortic wall.
The catheters and the flow probe, pressure transducer and EKG connectors were tunneled subcutaneously and exteriorized out the left side and sutured at an interscapular position. A specially designed protective box with connectors was placed on the pig's back: it enabled us to record from the unanesthetized animal (photo 1).
Catheters were flushed daily with a normal saline solution and filled with a saline solution containing heparin (30 U/ml). Oxytetracyclin (50 mg/10 kg) was administered daily to prevent infection. The entire post-operative recovery was monitored and appropriate treatment administered if needed.

Experimental protocol:
There were 5 experimental groups with 5 animals per group and the animals were randomly assigned to each group :



a- Protective box and special turning connector
The protective box have three partitions (on left: for catheters, on right: for acquiring physiological datas, on middle: for hemorrhage catheter)
The special turning connector have 50 connections.



b- The physiologicals parameters are recorded on conscious animals thanks to a special turning connectors placed on the back of the pig.

PHOTO n°1

group 1: anesthetized pigs (A)
group 2. anesthetized and injured pigs (AI)
group 3: anesthetized and bled pigs (AB)
group 4: anesthetized, injured and bled pigs (AIB)
group 5: conscious bled pigs.(CB)

To achieve the ballistic injury, we used unfragmentable high velocity bullets (similating AK 74 round). These bullets were reconstituted according Fackler's technique (8). The target area for the shot was in the thigh muscle. The target area was determinated by radiography in order to avoid any fracture, large vessel or nerve damage. This standardized shot procedure also resulted in a standardized missile trauma (4).

We removed 15 ml/kg blood continuously over 60 min, in a logarithmic fashion to mimic a hemorrhage from a severed artery: the blood was removed uniformly in equal parts over succesive intervals of 9, 10, 12, 13 and 16 minutes (10, 11).

The pigs were fasted 12 h prior to experiment with water available ad lib. On the morning of the experiment, the pigs were brought to a holding cage to which they had previously been trained to become familiarized with the surroundings and used to the experimental procedure. The aortic and renal flow transducers were connected to the blood flowmeter (2202 Spectramed). The aortic pressure transducer and venus pressure transducer were connected to amplifiers (Signal Conditioning Amplifier 2310, Vishay Measurements). The EKG electrodes were connected to the amplifier (Universal Amplifier, Gould). All physiological parameters were recorded on a Dash IV recorder (Astro-Med).

A period of 30 min was allowed for the animal to become accustomed to the surroundings before performing the initial mesurements and taking any samples. After this 30 min period, baseline control measurements and a blood sample was taken (t-30). After the recording and samples were taken, the anesthetized groups received ketamine (10 mg/kg bolus iv and 0,5 mg/kg/min infusion). Then, they were rapidly taken to the ballistic laboratory. The post-anesthetic

measurements and sample were then obtained (t-15). From that moment, the physiological parameters were continously recorded until the end of the hemorrhage. In the groups receiving the ballistic injury, it preceded the third sample (t-5) and the start of hemorrhage (t-0). Samples were taken at 5, 9, 19, 31, 44 and 60 min; and physiological recordings were taken at 120, 180 and 360 min after the beginning of the hemorrhage. The anesthetic infusion was stopped at 60 min. These recording and sampling procedures were the same for each group. After the injury was induced, local treatment consisting of antisepsis and sticking plaster was carried out. Samples and recordings were made daily for four days in order to study the recovery. After the experiment, the animals were euthanized with an intravenous overdose of barbiturate.

Sample analyses :

Each sample require 40 ml of blood. Hematology were studied with a Coulter Counter T540. Coagulation tests were performed with a fibrometer (Merieux). Blood gases were mesured with an ABL 500 Blood Gas Analyzer (Radiometer). Biochemical analysis were made with a semi-automatic analyzer FP 900 (Labsystem), and ionograms with an automatic analyzer M644 (Ciba-Corning). Finally, catecholamines were measured by high-pressure liquid chromatography (Varian 5.3 LC-Chromatofield Eldec 103).

Physiological parameters :

Heart rate, cardiac output, renal blood flow, and arterial and venous pressure were directly recorded (see above). Systemic vascular resistance was calculated by dividing the mean arterial pressure by the cardiac output. Renal vascular resistance was estimated as the ratio of mean arterial pressure to renal blood flow. Stroke volume was calculated with the fraction: cardiac output/heart rate.

Statistical analysis :

The homogeneity of the baseline values was tested with a Friedman pseudo two-way ANOVA (21,17). To ascertain whether there were changes within a group with time, we performed a Wilcoxon signed rank test comparing post-hemorrhage values to the control values.

First, we determined whether there were differences between groups using the Mann-Whitney U test. In order to elucidate how ballistic injury modified the effects of hemorrhage, we made the following comparisons :

1) To determine the effect of hemorrhage alone in anesthetized animals, we compared the non-injured, non-bled group (A) with the non-injured, bled group (AB).

2) To determine the effect of injury alone in anesthetized animals, we compared the non-injured, non-bled group (A) with the injured, non-bled group (AI).

3) To determine the effect of the combined injury and hemorrhage in anesthetized animals, we compared the non-injured, non-bled group (A) with the injured, bled group (AIB).

4) To determine the effect of hemorrhage on the injured animal, we compared the injured, non-bled group (AI) with the injured, bled group (AIB).

Lastly, we analyzed the effects of anesthesia on the hemorrhage response by comparing the anesthetized, bled group (AB) to the conscious, bled group (CB).
Statistical significance was accepted at $p<0.05$. The data is expressed as mean $\pm$ SEM.

III- RESULTS

Six pigs died before the experiment : 2 from aortic ruptures because of the flowmeter, and 4 from cardiac fibrillation during surgery which occurred at the time of suturing the strain gauge to the left ventricle in spite of prophylactic xylocaine treatment. We were thus compelled to omit the strain gauge technique. Two pigs were excluded because they developed a perforated ulcer with uncontrolled blood loss.
We originally planned to remove 24 ml/kg blood volume, but all the anesthetized pigs (three) died. So we used a smaller hemorrhage

study all the pigs throughout the recovery period, we decided to perform a 15 ml/Kg hemorrhage.

Controls values :

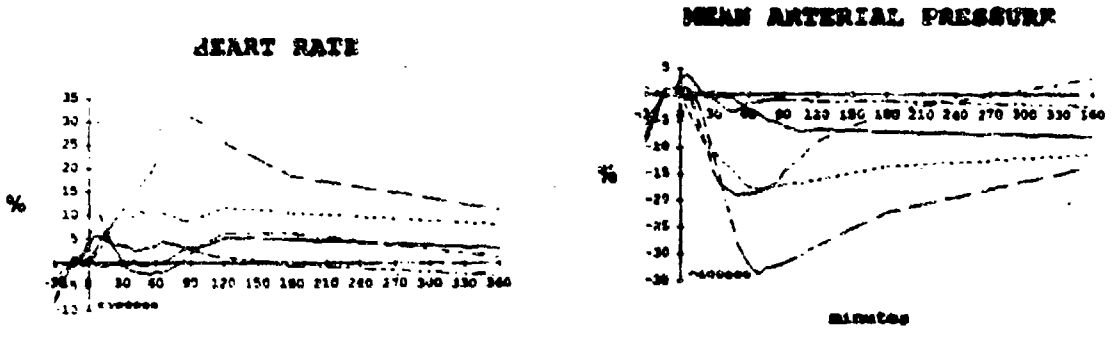
Control levels were similar to those reported in previous published studies, except parameters wich were changed because of the operations (enzymology). Depending on whether comparisons were made on the acute or recovery phases of the study, two control values were used. For the acute (0-360 min) phase, the first point before the experiment but after anesthesia administration was used. For the recovery (24 to 96 hours) phase, the point before anesthetic administration was used. To allow comparisons, the control data point for each variable was assigned a normalized value of 0 and all other values were corrected to reflect relative changes. All the values (mean and SEM) are submitted in the appendix. The interesting changes are shown in curve form (figures 1 to 5).

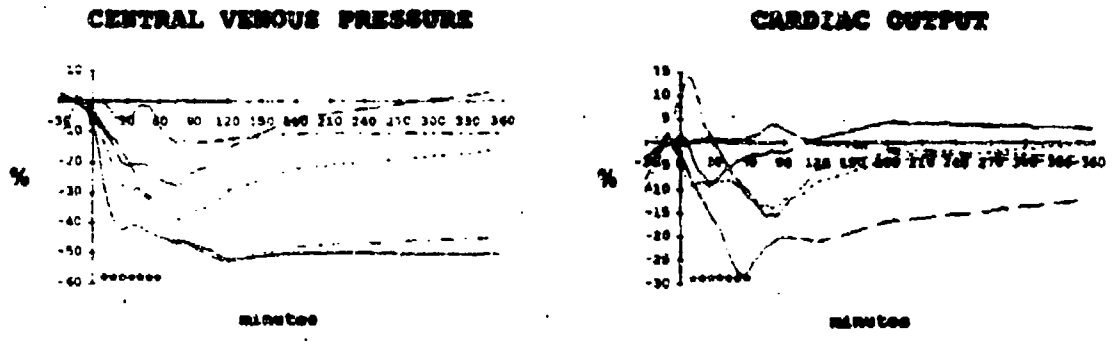
Hemodynamics responses :

Baseline values of all physical parameters did not change during the time-control, pre-injury and/or pre-hemorrhage periods.
Figure 1 shows the changes in heart rate (HR), mean aortic pressure (MAP), central venous pressure (CVP) and cardiac output (CO). Hemorrhage caused a significant ($p<0.05$) 20% increase in HR between initial and post-hemorrhage values only in the anesthetized, non-injured bled group (AB). There were no time-related changes in HR in any of the other four groups (A, AI, AIB and CB). For the between group comparisons, the AB group had a significantly higher HR when compared to the control group (A vs AB, $p<0.05$) as well as the conscious bled group (AB vs CB, $p<0.01$). Ballistic injury had no effect on HR, either by itself or in combination with hemorrhage.

This level of hemorrhage caused MAP to fall significantly, both with respect to time and when compared to the time control group, by 20% in the conscious group ($p<0.05$) and by 30% in the anesthetized group ($p<0,01$), and MAP did not return to control levels even after 240 min. There was a heterogenous response (initial decrease and then

FIGURE N°1





Hemodynamic changes in the five groups: Anesthetized (-·-·-), Anesthetized and injuried (——), anesthetized and bled (– –), anesthetized , injuried and bled (– · –), conscious bled (····) (time of hemorrhage: ·····)

which did not permit us to detect a significant difference. As with HR, ballistic injury had no effect on MAP, either by itself (A vs AI) or in combination with hemorrhage (A vs AIB). This suggests that ballistic injury attenuates the fall in MAP induced by this level of hemorrhage in anesthetized animals.

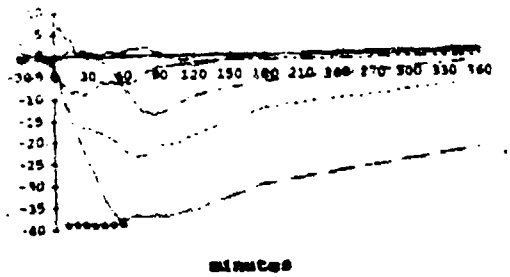
Central venous pressure (CVP) decreased significantly ($p<0.05$) between pre and post-treatment values in all treated groups : by 45% in the AB group, 40% in AIB, 35% in CB, and 25% in the AB group ($0.05 < p < 0.10$). The CVP recovered toward control values at 2 h after hemorrhage in the anesthetized bled group (AB) but not in the injury alone group (AI) or the combination group (AIB). Between-group comparisons showed significant differences between A vs AI ($p<0.01$), A vs AIB ($p<0.05$), and AB vs CB ($p<0.05$).

Cardiac output (CO) was significantly ($p<0.05$) reduced from pre-hemorrhage values by 25% in the anesthetized bled group (AB). Although there was a tendency for CO to fall in the order groups (by 12% in the combination AIB group and by 10% in the conscious bled (CB) group), the responses were heterogenous and did not permit us to find statistical significance. The anesthetized hemorrhage group (A vs AB) had a significantly ($p<0.01$) greater response than the combination of ballistic injury and hemorrhage group (A vs AIB), again indicating that the ballistic injury attenuated the fall in CO in response to the hemorrhage. There was also a significant ($p<0.01$) difference between the anesthetized and conscious bled groups (AB vs CB).

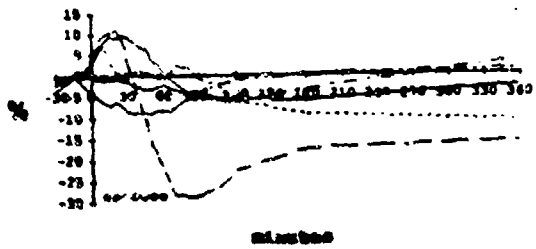
Figure 2 shows the changes in stroke volume (SV), systemic vascular resistance (SVR), renal blood flow (RBF) and renal vascular resistance (RVR).

Stroke volume (SV) was significantly ($p<0.05$) reduced between pre and post-hemorrhage values in both the anesthetized (35%, AB) and the conscious (20%, CB) hemorrhaged groups. SV remained lower than baseline for the entire 5 hour experimental period in the AB group.

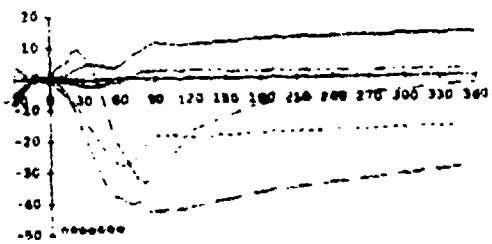
STROKE VOLUME



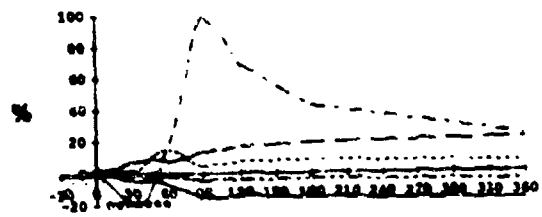
SYSTEMIC VASCULAR RESISTANCE



RENAL BLOOD FLOW



RENAL VASCULAR RESISTANCE



Hemodynamic changes in the five groups: Anesthetized (-···-), Anesthetized and injuried (——), anesthetized and bled (– –), anesthotized , injuried and bled (–·–), conscious bled (····) (time of hemorrhage: ·····)

Hemorrhage reduced SV significantly ($p<0.01$) in the anesthetized bled group when compared to the time control group (A vs AB). Only the anesthetized bled (AB) group and the combination injury and hemorrhage (AIB) group decreased SVR significantly ($p<0.05$) by 25% and 10%, respectively, between initial and post-hemorrhage values. There were no significant differences between any of the groups at the end of hemorrhage (AI vs AIB, AB vs AIB, AB vs CB).

There was a significant ($p<0.05$) decrease in renal blood flow (RBF) by 40% in the anesthetized bled group (AB) and by 30% in the conscious bled group (CB) between the initial and post-hemorrhage values. Hemorrhage group had a significant ($p<0.01$) decrease in RBF.

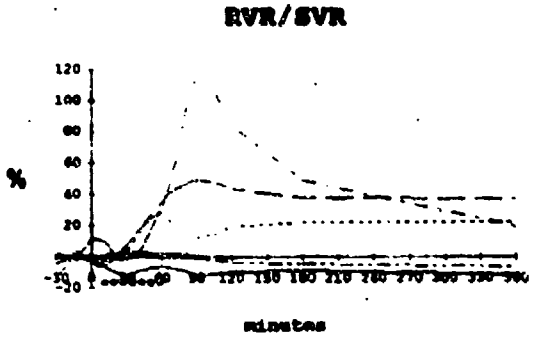
There was no change in renal vascular resistance (RVR) in any group between control and post-hemorrhage values. The increase in RVR in the combination (AIB) group was caused by heterogenous values during the period (after 60min) when the animals were recovering from anesthesia. There were also no significant differences between groups.

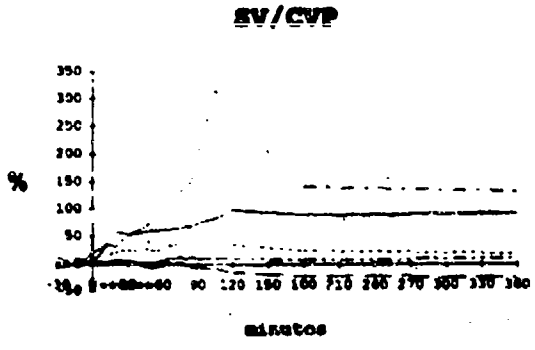
Figure 3 shows the ratios of RVR/SVR and SV/CVP.

There was a significant ($p<0.05$) increase in the RVR/SVR ratio of 35 % in the AB group between the control and post-hemorrhage values. The RVR/SVR ratio was significantly ($p<0.05$) greater in the A vs AB group but not in the A vs AIB group. The RVR/SVR ratio was also significantly greater in the AB group compared to the CB group. There were no other significant differences between any of the other groups.

There was a significant ($p<0.05$) increase in the SV/CVP ratio, by 60% in the AI group and by 100% in the AIB group between the pre and post-hemorrhage values. The increase by 320% in the AIB group was caused by a heterogenous response during the period when the animals were recovering from anesthesia. Ballistic injury increased significantly ratio SV/CVP, either by itself ($p<0.01$) or in combinaison with hemorrhage ($p<0.05$).There were no other significant differences between any other groups.

FIGURE N°3





Hemodynamic changes in the five groups: Anesthetized (—·—), Anesthetized and injuried (——), anesthetized and bled (– –), anesthetized , injuned and bled (—·—), conscious bled (···)
(time of hemorrhage: *****)

Only the parameters with significant variations are shown in the figures 4 and 5.

Hemorrhage produced an increased release of epinephrine with significant ($p<0.05$) differences at +60 min in all three hemorrhage groups (AB, CB, and AIB) when compared to the pre-hemorrhage value. The comparisons between the AI vs AIB, the A vs AB, and AB vs CB groups were significant ($p<0.05$).

Glucose was increased by 35%, 25 % and 10%, respectively in the three groups: AB ($p<0.01$), AIB ($p<0.01$), and CB ($p<0,05$) groups when compared to pre-hemorrhage values. There was a late 20% increase in glucose in the anesthetized and trauma alone (AI) group at 360 min ($p<0.01$). There were no significant differences between groups.

Plasma creatinine increased ($p<0.01$) by 38% in AIB group and by 18% in AB group at 180 min. At this time, there were significant ($p<0.01$) differences between the AI vs AIB, A vs AB, AB vs CB, and A vs AIB groups.

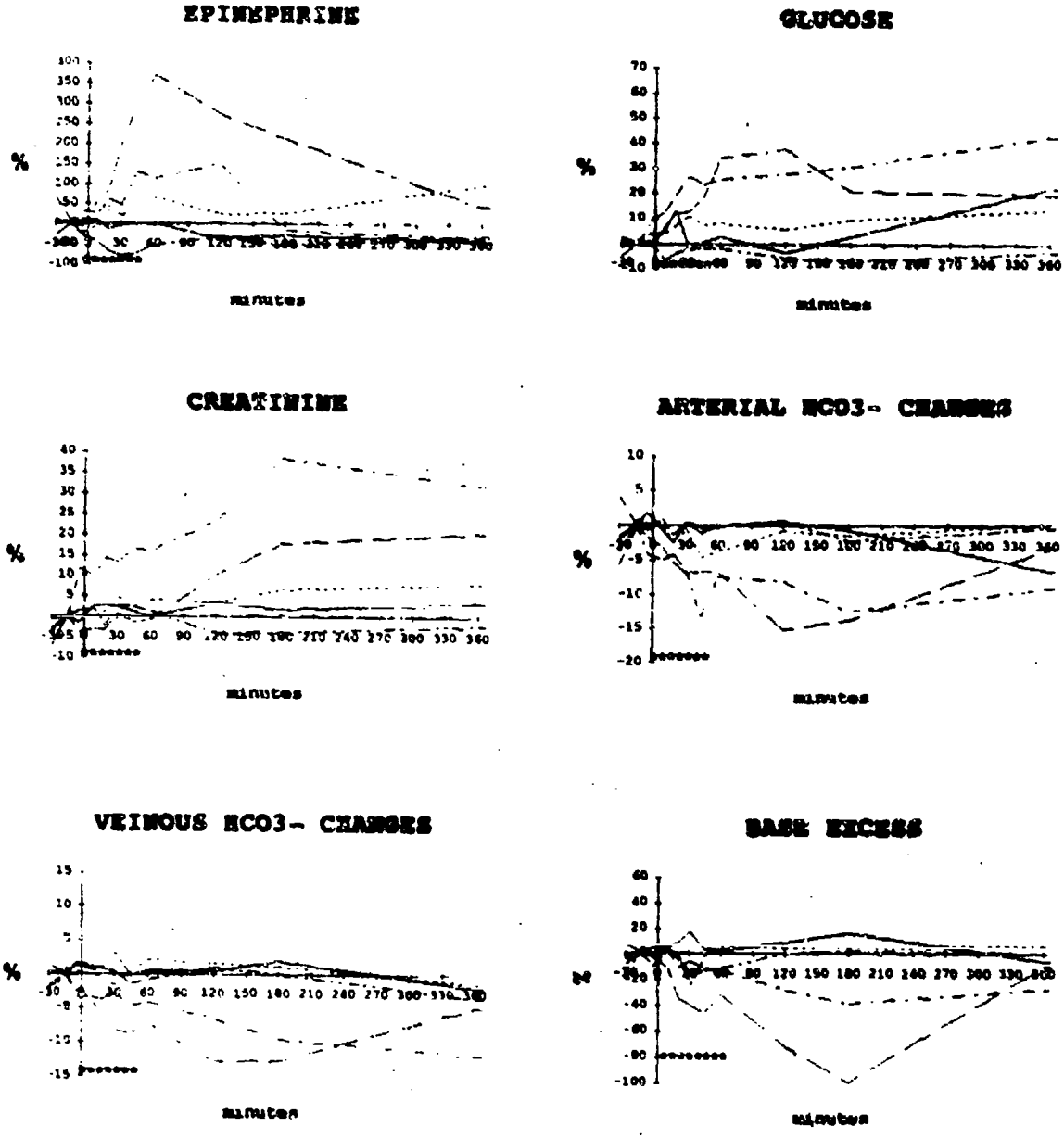
Blood PH and blood gases didn't shown significant variations between pre and post-hemorrhage values. However, plasma bicarbonate was decreased significantly ($p<0.05$ at + 180 min) in both the AB and AIB groups. Six hours after hemorrhage, arterial bicarbonate tended to return toward its control value but only in the AB group. At this time, arterial bicarbonate was decreasing in the AI group. There were no significant differences between groups.

Figure 5 shows some biological parameters which presented some significant long-term changes, to 96 hours after the experiment.

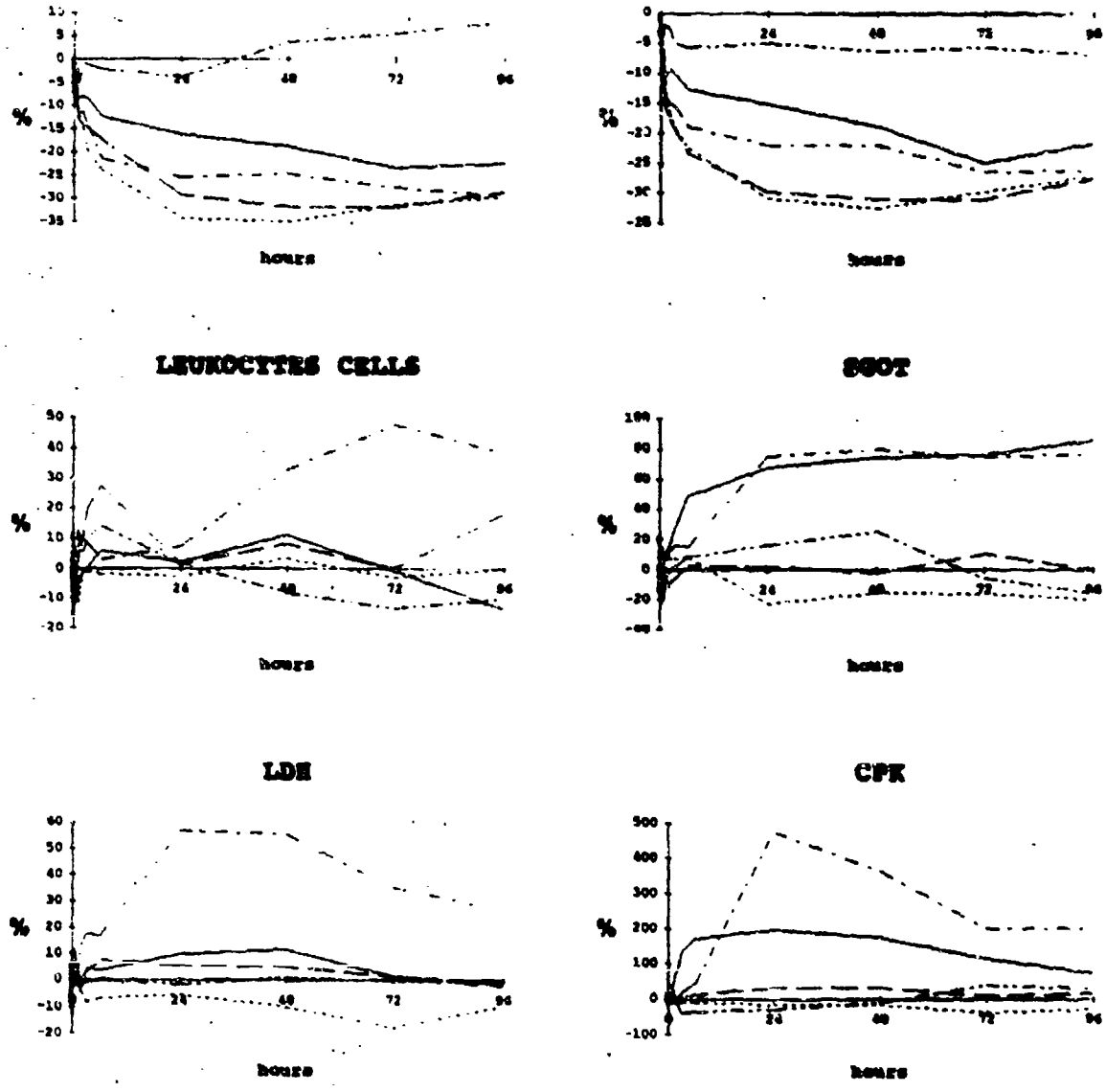
Hematocrit and hemoglobin levels fell rapidly until 6 hours ($p<0.01$) and more moderatly until 24 hours in the 3 bled groups (AB, CB, and AIB). At this time, there were no statistically significant differences between those groups.

The number of leukocytes presented a moderate increase (10 to 25%) at 6 hours. and a second larger increase (+45 %) at 72 hours in the AIB group. These changes were significant. There were no significant changes between the groups.

FIGURE N°4



Biological changes in the five groups. Anesthetized (–·–), Anesthetized and injuried (——), anesthetized and bled (– –), anesthetized , injuned and bled (–··–), conscious bled (····) (time of hemorrhage: ·····)



Biological changes in the five groups: Anesthetized (—·—), Anesthetized and injuried (——), anesthetized and bled (– –), anosthetized , injuried and bled (—·—), conscious bled (· · ·) (time of hemorrhage: "")

Reflecting cellular destruction, the enzymes SGOT, LDH and CPK were increasing to a peak at 24 hours in both trauma groups (AI and AIB). The increase in the AI group was similar to the AIB group for SGOT, but somewhat less for LDH and CPK.

IV- DISCUSSION

For this study, we used the splecnectomized pig model. This model is considered as one of the best with respect to hypovolemia, and also the best with respect to studying projectile injury (20). In fact, the muscular thickness of the thigh (about 14cm), allows one to obtain a significant cavitation effect (4) and therefore the resulting tissue lesions are more representative of those which are observed in humans (1). Furthermore, we have chosen the site of impact so that there will neither be a diaphyseal fracture (distance between diaphysis and projectile trajectory > 7cm), nor damage to a major blood vessel. Under these conditions, the hemorrhage due to the damage from the projectile is minimal. The ballistic injury is administered just before the hemorrhage, thus making these conditions more realistic to those seen in combat. In creating a ballistic injury, the rules of good laboratory practice require the experimenter to anesthetize the animals. We have chosen to use Ketamine as the anesthetic because it modifies the function of the cardiovascular system minimally during hypovolemia (25, 26, 27). After administration of the anesthetic, we have found a slight increase in heart rate, mean arterial pressure, and aortic flow. These results, in agreement with those given in references, are consequence of central stimulation of the sympathetic system (24, 26, 25). In preliminary measurements of the plasma volume using the Evan's Blue method, we showed that the total blood volume of the splenectomized, 90 kg, Large White Pig, varies between 60 to 66ml/kg. A hemorrhage of 15 ml/kg therefore corresponds to a moderate hemorrhage of 25% of the total blood volume. Such a blood loss does not provoke a maximal sympathetic stimulation ; this allows us to compare the amount of stimulation evoked by different treatments.

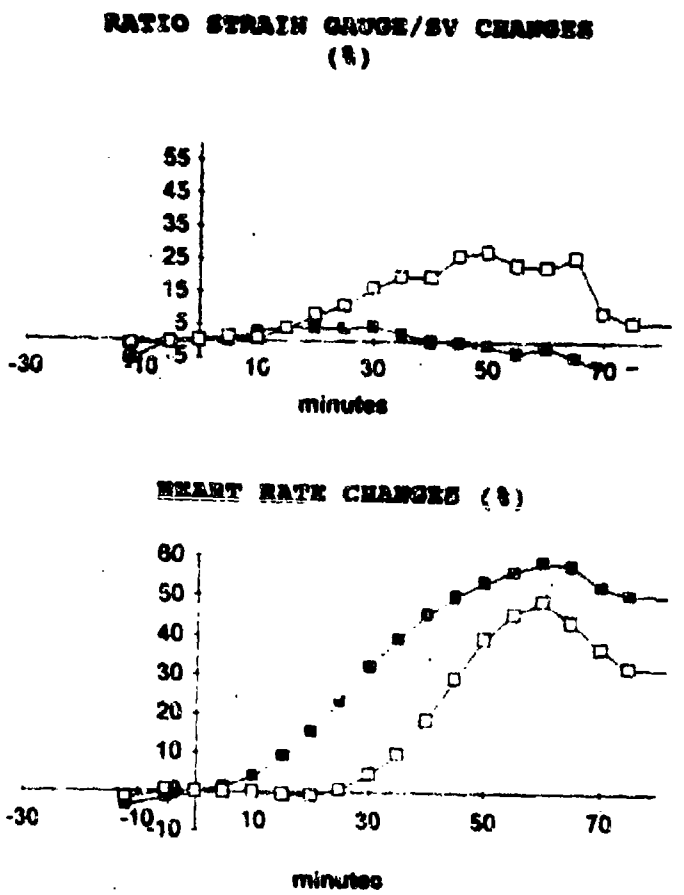
In the conscious animal, a hemorrhage of 25% provokes a very mild response. Because of an insufficient number of animals in this study, the changes observed in the conscious animals were frequently statistically insignificant. Likewise, in the anesthetized animals, we have found some physiological responses of variable intensities. Nevertheless, in either conscious or anesthetized animals, the physiological responses to the hemorrhage were generally in accord with those given in the literature (10, 13, 2, 16). The response corresponds to the classic scheme of a moderate sympathetic reaction: the reduction of blood volume and arterial pressure stimulates the sympathetic system via the volume and baroreceptors, which immediately causes an increase in heart rate and vasoconstriction of certain peripheral vascular beds like the kidneys. As found in many other animal studies, the decrease in renal flow was independent of the decrease in aortic flow. The variable, RVR/SVR, gives a good idea of this differential vasoconstriction. In contrast, we observed that the systemic vascular resistance decreased in this study. Hannon has reported similar results in the literature of porcine hypovolemia. The variability of the physiological parameters found in the conscious and anesthetized hemorrhaged groups generally agree in some ways but are of different intensity: they are more marked when the animal is anesthetized. In fact, the administration of anesthetic, general, is a factor which aggravates the response to hypovolemia. There exist many hypotheses concerning the mechanisms of action of ketamine: it can diminish the vasomotor responses, in spite of its effects on stimulating sympathetic discharge centrally, and it has a depressant effect on the myocardium (24). Our study shows effectively a large drop in the stroke volume (the increase in heart rate wasn't sufficient to be the cause) in animals anesthetized with ketamine.

The projectile used in this study has a speed between 900 and 950m/sec at impact. The injury caused to the soft tissue of the thigh shows those local hemodynamic modifications as described by Rybeck, Holmström and Almskog: a large zone of hyperemia surrounds the ischemic area adjacent to the projectile trajectory. Thus, in the animals of the AI and AIB groups, we saw a cutaneous vasomotor reaction (RVMC of Breteau) appearing some minutes after the injury,

giving evidence of the existence of this phenomenon in the present study. Rybeck has shown that the local lesions are accompanied by an increase in the loss of blood in each of 2 limbs, with a slight reduction of arterial pressure and heart rate. It suggests the possible action of vasodilatory or neurogenic substances, but does not explain the non-cardiac response.

In the anesthetized and ballistically wounded animals, we have found a consistent decrease of the CVP, the other parameters do not present significant variations. The CVP decreased rapidly until 30min after the injury and it was maintained at this low level. This drop indicates an increase in the venous capacitance which could be due to the slow liberation of vasoactive substances by the injured tissue.

The animals in the injury and hemorrhage group presented rather heterogenous responses, which explains their occasional lack of statistical significance and makes it difficult to interpret. Nevertheless, all show a drop in CVP like those observed in the anesthetized, injured without hemorrhage. One would therefore hypothesize, as we have noted with the 18 ml/kg hemorrhage experiment, that the injury would aggravate the effects of hemorrhage. But this study has shown that for the hemorrhage of 15ml/kg, the arterial pressure subsides less when there is trauma associated with it. Two hypotheses can be advanced : either (1) peripheral vasoconstriction, or (2) the inotropy of the heart appears more effective in this case. Evidence against the first hypothesis, only 1 of 5 animals reacted with an intense vasoconstriction (the reason for the large response observed in the AIB group on the RVR and RVR/SVR curves. The other subjects appear to have maintained their arterial pressure with an increase in inotropy. Thus, in spite of a low preload, the stroke volume dis not drop significantly, contrary to that observed in the anesthetized hemorrhaged group. The results which we have obtained of the animals instrumented with the myocardial strain gauge appears to confirm this hypothesis. Figure N° 6 shows the time course of the change in heart rate on the bottom panel and the relative change in the ratio of cardiac strain gauge over stroke volume on the top panel, for one animal in the AB group and one animal from the AIB group. This figure gives evidence for the inotropic hypothesis: one sees that



Comparison of the strain gauge/stroke volume (reflection of myocardial inotropy) and the heart rate changes in the same animal from 2 groups: anesthetized with hemorrhage (-■-) and anesthetized, wounded with hemorrhage (-□-).

[illegible] FC/SV ratio increased when there was an injury, [illegible] to hemorrhage alone while the heart rate increased later. In the hemorrhaged animal without injury, the heart responds almost exclusively with an early increase in the heart rate. The ratio SV/CVP has been calculated to evaluate the inotropy for the group of animals of each of the groups: this ratio increased significantly with the injury confirming the previous hypothesis.

It appears therefore, that in the case of a hemorrhage preceded by a ballistic injury, the heart used the mechanism of its increased inotropy, rather than its rate, to compensate for the hypovolemia. This reaction, which is effective for a hemorrhage of low volume, can become unsufficient or result in cardiac fatigue for a larger hemorrhage, as we have observed in the animals injured and hemrrhaged at 10ml/kg, which died at the end of hemorrhage. However, to confirm this hypothesis, additional experiments will be necessary.

Inotropy and heart rate are modulated by the vagal and sympathetic activity. A modification of the responses of these parameters can come from the modulation of the balance between the two system's central control nuclei. Also, it will be particularly interesting to study the precise role of the vagus, by vagotomy, injection of atropine, or a dose of pancreatic polypeptide.

The modifications of hematologic and biochemical parameters reflect the physiological responses which resulted from the injury and/or the hemorrhage : the drop in hematocrit and the rate of hemoglobin are evidence of transcapillary refill. The epinephrine concentration reached its maximum at the end of hemorrhage reflecting increased sympathetic activity. The increase of the creatinine is a consequence of renal disfunction. The blood gases and pH, the hydroelectric equilibrium did not vary in a significant fashion. In contrast, the bicarbonate and the base excess dropped moderately, which corresponds to a well compensated hypovolemia. With the animals injured and hemorrhaged, the enzymes, evidence of cellular lysis, are liberated in a slower fashion but more intensely than in the wounded but not hemorrhaged group, reflecting the differences of local perfusion.

In conclusion, an injury of soft tissue by a projectile under anesthesia, modifies the physiological responses of the organism to

with hemorrhage, the heart utilizes the mechanism of increased inotropy rather than increased chronotropy, for contending against the hypovolemia. This compensatory reaction, effective for the small loss of blood (25%) became insufficient with a larger hemorrhage. The model of simple hemorrhage is therefore not quite representative of that which one would observe on the battlefield where hemorrhage is frequently the consequence of a bullet wound. There may be some limit in extrapolating the conclusion gained from this anesthetized, combintion wound-hemorrhage model to that expected in the conscious animal, because the anesthesia itself modifies appreciably the responses to hemorrhage.

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velocity missile injury. [illegible]

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ANNEX

AI anesth+injured; AB anesth+bled;CB concious bled;AIB anesth+injured+bled;A anesth

time (min)	30	-15	5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	7
H.R. (beat/min)																			
Mean AI	105	109	110	113	115	115	114	113	113	113	112	111	112	112	112	113	113	113	11
SEM	4,98	5,80	6,72	8,16	9,02	8,35	8,32	8,18	8,55	8,44	8,56	8,89	8,92	9,08	10,02	9,93	9,77	8,95	8,1
Mean AB	102	108	108	108	110	113	115	116	118	120	121	123	125	127	128	131	132	134	13
SEM	8,49	9,31	9,31	9,12	8,32	8,00	7,56	8,74	10,86	14,66	17,99	21,10	23,05	24,70	24,89	24,71	23,42	22,93	21,9
Mean CB	102	102	102	102	104	105	107	110	111	112	112	113	114	114	114	115	114	113	11
SEM	3,54	3,93	4,39	5,13	7,27	7,71	9,71	11,60	14,53	15,59	17,11	20,08	21,41	19,61	18,11	16,09	14,69	13,71	13,4
Mean AIB	99	108	110	114	117	119	115	113	110	108	108	105	106	106	105	106	106	107	10
SEM	3,75	9,81	12,85	18,15	23,23	25,20	16,80	15,22	11,81	8,85	9,44	10,67	12,54	14,09	14,67	14,34	14,19	13,79	13,8
Mean A	104	112	112	113	112	111	111	111	111	111	111	112	111	111	112	112	112	112	113
SEM	6,02	3,36	3,97	2,15	1,90	2,38	3,02	2,94	3,35	3,37	3,26	2,77	2,99	2,61	3,06	3,36	4,06	4,39	4,50
M.A.P. (mmHg)																			
Mean AI	95	104	105	107	107	107	105	103	103	103	103	103	103	102	101	101	100	100	99
SEM	8,96	13,67	15,10	18,03	20,42	17,99	17,01	15,96	14,90	14,43	14,15	14,47	15,15	16,26	17,53	17,87	17,85	17,06	16,24
Mean AB	95	101	101	102	102	101	100	97	94	90	85	81	78	74	72	71	69	69	70
SEM	3,59	5,64	6,74	9,17	12,07	13,58	15,03	16,74	17,99	18,38	18,36	19,00	18,68	18,54	18,87	18,26	17,79	16,98	15,47
Mean CB	96	94	94	94	93	90	88	86	84	83	82	81	80	79	78	77	77	77	77
SEM	2,85	2,99	2,83	2,43	2,94	5,10	6,34	7,18	8,97	10,91	12,81	14,20	15,14	14,54	14,87	15,08	15,20	15,75	16,37
Mean AIB	91	99	99	100	100	98	95	92	88	84	82	81	81	80	80	80	80	81	8
SEM	1,94	4,06	5,01	5,38	4,97	5,74	7,93	9,46	12,67	16,11	18,02	19,03	20,07	20,96	21,85	22,36	22,36	21,94	21,42
Mean A	95	104	105	103	103	103	104	104	104	103	102	101	101	101	101	102	102	103	103
SEM	10,37	12,28	14,05	13,01	12,77	11,99	11,75	11,40	11,25	11,12	10,74	10,80	10,81	10,61	10,94	10,99	10,66	10,78	10,77
C. V. P. (mmHg)																			
Mean AI	5,4	5,5	5,3	5,1	4,7	4,1	3,6	3,4	3,3	3,3	3,4	3,4	3,3	3,3	3,2	3,2	3,1	3,1	3,1
SEM	0,43	0,50	0,84	1,16	1,29	1,23	1,26	1,36	0,91	0,94	0,96	0,91	0,86	0,83	0,81	0,78	0,79	0,77	0,76
Mean AB	4,8	4,7	4,7	4,8	4,5	4,2	4,1	3,9	3,7	3,7	3,7	3,7	3,7	3,6	3,6	3,4	3,4	3,4	3,3
SEM	0,34	0,33	0,34	0,46	0,45	0,60	0,70	0,76	0,86	0,99	1,13	1,24	1,32	1,29	1,32	1,33	1,27	1,24	1,27
Mean CB	4,8	4,8	4,8	4,8	4,4	4,1	3,8	3,6	3,4	3,3	3,3	3,3	3,2	3,2	3,1	3,1	2,9	2,9	2,8
SEM	0,23	0,34	0,44	0,55	0,66	0,75	0,78	0,67	0,82	0,44	0,34	0,32	0,36	0,39	0,44	0,49	0,53	0,56	0,58
Mean AIB	4,7	4,5	4,4	4,3	4,3	4,1	3,9	3,9	3,7	3,5	3,4	3,2	3,1	2,9	2,7	2,4	2,3	2,2	2,1
SEM	0,51	0,54	0,53	0,70	0,75	0,76	0,73	0,75	0,72	0,73	0,73	0,75	0,80	0,82	0,85	0,88	0,90	0,91	0,98
Mean A	5,2	6,0	5,8	6,0	6,0	6,0	5,8	5,7	5,7	5,7	5,7	5,9	5,9	5,9	5,8	5,5	5,4	5,3	5,3
SEM	0,91	0,94	0,88	1,38	1,14	0,92	1,02	0,94	0,91	0,91	0,81	0,86	0,59	0,56	0,59	0,46	0,49	0,48	0,57
C. O. (l/min)																			
Mean AI	14,4	15,1	15,2	15,3	15,2	14,8	14,3	14,1	13,9	13,9	14,1	14,3	14,4	14,6	14,6	14,7	14,7	14,8	14,8
SEM	1,74	1,82	2,00	2,38	2,63	2,44	2,28	2,19	2,36	2,33	2,47	2,78	2,83	2,77	2,81	2,78	2,63	2,63	2,72
Mean AB	12,8	13,2	13,2	12,8	12,5	12,1	11,6	11,4	11,1	10,8	10,5	9,9	9,6	9,3	9,1	9,3	9,6	9,8	10,0
SEM	0,61	0,52	0,52	0,82	1,14	1,85	2,13	2,33	2,51	2,87	3,08	3,59	4,01	4,32	4,45	4,54	4,49	4,57	4,72
Mean CB	14,1	13,7	13,5	13,2	12,8	12,4	12,5	12,5	12,4	12,5	12,5	12,5	12,5	12,4	12,3	12,2	11,9	11,7	11,8
SEM	0,71	0,70	0,80	0,76	1,26	1,41	1,55	1,88	2,38	2,88	3,46	3,61	3,69	3,38	3,54	3,59	3,25	3,17	3,26
Mean AIB	14,4	16,0	16,8	17,5	18,0	17,9	17,4	16,5	16,3	15,9	15,6	15,3	15,0	14,8	14,5	14,2	14,2	13,9	13,7
SEM	2,92	3,90	5,12	6,03	6,84	6,62	6,50	5,90	5,42	6,70	6,59	6,19	5,81	5,51	4,89	4,43	4,31	3,99	3,69
Mean A	13,5	14,6	14,7	14,6	14,6	14,7	14,7	14,7	14,8	14,7	14,8	14,7	14,7	14,7	14,7	14,8	14,9	15,0	15,1
SEM	1,12	1,16	1,17	1,06	1,00	1,12	1,22	1,35	1,45	1,51	1,66	1,76	1,73	1,72	1,65	1,46	1,11	0,94	0,82

AI:anesth+injured. AB:anesth+bled;CB:conscious bled;AIB:anesth+injured+bled,A:anesth

time (min)	60	65	90	105	120	180	300	1440	2880	4320	5760
H.R. (beat/min)											
Mean AI	113	112	112	113	114	114	112	111	109	105	104
SEM	7,18	6,26	5,49	5,03	3,60	5,62	9,04	13,12	17,54	21,59	24,25
Mean AB	139	140	141	139	135	129	120	112	106	101	100
SEM	21,96	22,39	22,41	18,92	12,89	10,50	6,37	6,89	10,12	10,06	10,67
Mean CB	112	112	112	113	115	114	111	109	106	102	102
SEM	13,11	13,06	14,05	16,86	20,06	21,98	21,74	21,44	19,26	16,00	18,05
Mean AIB	108	109	110	113	115	115	106	104	95	90	85
SEM	14,02	14,18	14,26	15,99	16,62	16,03	18,45	24,31	31,47	41,32	51,05
Mean A	114	115	115	114	113	111	106	107	107	109	109
SEM	5,08	5,12	4,56	4,39	4,64	4,00	5,40	6,42	6,05	6,59	5,35
M.A.P. (mmHg)											
Mean AI	99	98	98	97	97	97	98	98	94	94	95
SEM	15,66	15,29	15,07	14,85	14,83	14,59	14,62	15,35	17,46	15,56	15,89
Mean AB	70	71	71	73	75	81	88	96	102	107	108
SEM	14,71	13,17	12,08	11,06	10,67	10,33	11,20	14,74	17,82	20,06	21,27
Mean CB	77	77	77	78	78	81	83	86	90	93	95
SEM	16,41	16,74	16,79	17,00	16,14	14,13	12,68	11,60	10,99	11,09	11,54
Mean AIB	82	83	84	87	91	96	102	102	100	97	87
SEM	20,47	20,75	20,45	20,04	21,30	21,21	19,08	15,53	19,23	27,47	49,29
Mean A	103	103	103	103	103	103	101	99	97	93	93
SEM	10,49	10,23	9,96	10,22	10,47	11,52	12,52	12,73	13,36	12,51	14,99
C. V. P. (mmHg)											
Mean AI	3,1	3,1	3,0	2,9	2,8	2,8	2,8	3,1	3,3	3,5	3,6
SEM	0,83	0,80	0,67	0,94	1,04	0,91	0,92	0,90	0,84	0,92	1,01
Mean AB	3,4	3,5	3,6	3,7	4,0	4,5	4,8	5,5	6,3	6,5	6,8
SEM	1,22	1,21	1,23	1,24	1,22	1,00	0,73	0,46	0,41	0,51	0,70
Mean CB	2,8	2,8	2,9	3,0	3,3	3,7	4,0	4,2	4,5	4,8	4,5
SEM	0,68	0,86	1,07	1,12	0,98	0,86	0,72	0,63	0,71	0,81	0,82
Mean AIB	2,2	2,1	2,1	1,9	1,9	2,1	2,3	2,6	2,9	3,2	3,3
SEM	1,02	1,11	1,20	1,23	1,13	0,91	0,83	1,06	1,45	1,79	2,09
Mean A	5,3	5,2	5,3	5,3	5,3	5,4	5,4	6,0	6,1	5,4	5,6
SEM	0,68	0,74	0,65	0,98	1,05	1,06	1,22	1,22	1,19	1,08	0,86
C. O. (l/min)											
Mean AI	14,9	14,8	14,8	15,0	15,3	15,5	15,6	15,6	15,3	15,0	14,6
SEM	2,70	2,74	2,85	3,15	3,46	4,41	4,59	4,44	4,18	4,12	3,31
Mean AB	10,1	10,3	10,3	10,3	10,2	10,8	11,5	12,1	12,8	13,6	13,8
SEM	4,76	4,67	5,08	5,00	4,81	3,86	3,08	2,30	1,89	1,12	1,49
Mean CB	11,7	11,7	12,0	12,1	12,5	13,1	13,7	14,0	14,5	15,0	15,1
SEM	2,88	2,55	2,76	2,65	2,34	2,04	1,57	1,67	2,03	2,11	2,07
Mean AIB	13,7	13,7	14,0	14,6	15,2	15,6	15,3	14,7	13,9	12,9	12,1
SEM	3,71	3,75	3,84	3,92	4,14	4,30	2,64	1,38	2,49	4,55	6,85
Mean A	15,2	15,2	15,1	14,8	14,6	14,4	14,2	13,8	12,7	12,8	13,9
SEM	0,78	0,74	0,74	0,99	1,26	1,40	1,62	1,48	2,22	1,46	0,74

AI anesth+injured, AB anesth+bled,CB concious bled,AIB anesth+injured+bled,A anesth.

time (min)	-30	-15	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
S. V. (ml/beat)																			
Mean AI	134	135	132	131	127	126	123	124	123	123	125	127	126	127	126	127	126	127	127
SEM	12.41	12,32	14.73	18,73	20,24	21,33	20,23	19,00	20,46	19,74	20.70	22,83	21,94	20,81	20,62	19,16	18.67	19.60	21,63
Mean AB	125	123	123	119	115	109	104	99	95	91	87	82	78	75	73	73	74	74	73
SEM	6.91	9,02	11.64	14,30	17,89	21,68	21.65	21,52	21.28	24,09	25,89	30,47	33,73	36,12	36,71	36,85	35.46	35.01	34.92
Mean CB	139	134	132	129	122	116	117	114	112	112	111	111	110	109	107	105	104	103	103
SEM	5.72	7,21	8.39	11,28	17,78	19,02	18,75	19,18	19.12	20.70	23.10	23,10	22,48	20,23	20,29	20.09	17.87	17.71	18.41
Mean AIB	146	149	154	157	156	155	154	149	149	148	149	147	146	144	142	138	137	134	131
SEM	31.74	36,68	50.99	60.54	67,84	64,74	62,63	57,47	61.86	64,21	67.26	67,39	65,61	63,93	59,62	54,12	51.81	47.92	45.93
Mean A	131	131	131	130	131	133	133	132	133	132	132	131	132	132	132	133	133	133	134
SEM	13.16	10,56	11.46	8,02	8,36	9,77	10,04	10.73	11,41	11,78	12,74	13.94	13,93	14,00	13,45	12.15	9.92	8.50	8.39
S. V. R. (dynes*sec*cm)/5																			
Mean AI	6.78	7,03	7.15	7.24	7,46	7,59	7,72	7,65	7,74	7.67	7,60	7,50	7,48	7,28	7,21	7,05	6.98	6.91	6.84
SEM	1.04	1,22	1.32	1,54	1,73	1,59	1,64	1,02	1.77	1,73	1,78	1,90	1,97	1,99	2,08	2,09	2.04	1.99	1.68
Mean AB	7.60	7,74	7.72	8,03	8,32	8,43	8,48	8,51	8,36	7,95	7.64	7.32	7,00	6,61	6,40	6,14	5.88	5.75	5.75
SEM	0.32	0,50	0.60	0.92	1,47	1,76	1,94	2,17	2,27	2,10	2,01	1,94	1,84	1,67	1,66	1,52	1.43	1.37	1.35
Mean CB	6.60	6,90	7,00	7.17	7,42	7,35	7,14	6,9.	6,96	6,93	6,97	6,96	6,97	6,91	6,86	6,90	6.95	7.09	7.04
SEM	0.24	0,21	0.23	0.39	0.73	0,82	0,69	1.01	1,30	1,80	2,36	2,78	3,06	3,05	3,11	3,14	3.02	3.12	3.10
Mean AIB	6.49	6,46	6.29	6.18	6.12	6,04	5,99	6,06	5,99	5,89	5,85	5,88	5,85	5,86	5,88	5,89	5.89	5.97	6.04
SEM	1.10	1,36	1.62	1,78	1,90	1,91	1,96	1,90	2,00	2,03	2,06	2,03	1,92	1,83	1,69	1,51	1.36	1.25	1.11
Mean A	7.05	7,13	7.18	7,10	7,08	7,06	7,07	7,09	7,06	7,03	6,96	6,94	6,91	6,91	6,95	6,96	6.94	6.90	6.85
SEM	1.09	1,13	1.23	1,15	1,05	1,02	0,99	1,02	1,03	1,05	1,11	1,15	1,16	1,14	1,15	1,12	1.05	1.02	1.00
R. B. F. (cc/min)																			
Mean AI	769	824	825	824	830	832	836	844	853	861	866	861	859	854	854	859	872	881	889
SEM	55.80	74,79	73.23	85,32	84,20	82,07	81,42	57,36	51,93	50,03	44,47	40,34	37,13	38,72	42,49	46,64	50.13	50,66	49.08
Mean AB	799	834	838	835	831	817	797	766	732	694	652	619	587	561	537	533	518	515	522
SEM	32.35	45,82	54.49	78,25	97,78	109,85	119,70	134,17	140,61	139,40	132,16	137,89	130,41	121,69	131,68	129,80	116.40	114.04	113.53
Mean CB	790	778	773	772	760	748	735	718	702	681	652	628	605	582	566	557	557	565	581
SEM	23.51	17,66	19.97	32,10	42,86	51,82	50,65	43,13	32,56	32,04	30,87	67,90	76,81	86,88	91,57	86.44	78.83	69.44	63.95
Mean AIB	7'0	791	791	795	820	830	835	860	898	853	828	799	745	689	641	611	586	557	534
SEM	53.55	58,14	67.37	80,59	103,30	120,31	149,54	172,83	194,02	232,48	222,90	212,79	202,38	198,27	207,09	224,44	234.26	248.54	266.41
Mean A	761	726	727	720	720	722	719	718	716	712	711	711	712	715	720	723	727	732	738
SEM	29.68	18,51	25.88	22,36	21,29	19,70	20,33	19,93	20,52	20,52	19,36	18,65	19,31	19,62	21,50	22,25	23,66	24,80	24.80
R. V. R. (dynes*sec*cm)/5																			
Mean AI	124	125	127	129	129	128	125	122	120	119	119	120	120	119	118	117	115	113	111
SEM	3.33	5,46	7.40	10,20	11,98	12,93	12,68	11,94	11,36	11,24	11,59	12,33	13,32	14,50	15,65	16,15	16.04	15.37	14.39
Mean AB	119	120	121	121	123	124	125	127	128	129	131	131	131	131	131	131	131	132	132
SEM	2.10	1,62	1.74	2,66	3,73	5,97	8.93	12,65	15,66	18,02	19,14	20,09	20,13	20,90	22,37	24,30	24.65	24.73	23.30
Mean CB	121	122	122	123	122	121	120	120	120	122	126	130	133	137	140	14'	140	138	134
SEM	2.63	4,14	5.71	8,37	10,44	12,10	13,00	13,22	13,34	14,18	16,60	19,68	23,93	28,85	32,37	34,33	35.71	37.86	38.27
Mean AIB	121	124	124	124	121	118	113	107	102	99	100	103	110	120	134	147	160	179	200
SEM	5.60	7,11	10.07	15,67	19,83	23,13	24,30	24,07	22,94	22,26	21,33	22,16	25,09	31,60	44.52	57.27	68.74	84.35	105.24
Mean A	144	143	144	143	143	143	144	144	145	144	143	142	141	141	140	141	140	140	139
SEM	13.52	18,59	19.11	17,43	16,57	14,86	14,59	14,17	14,07	14,01	13,26	13,07	12,66	12,19	11,86	11,65	11,29	11.51	11.47

AI: anesth+injured, AB anesth+bled, CB concious bled, AIB anesth+injured+bled, A anesth

time (min)	80	85	90	105	120	180	360	1440	2880	4320	5760
S. V. (ml/beat)											
Mean AI	130	131	131	132	132	135	136	136	140	145	147
SEM	22,04	24,37	28,51	29,09	30,03	34,50	33,57	27,62	19,28	13,61	2,79
Mean AB	73	74	73	75	76	83	94	105	117	130	132
SEM	34,79	35,14	35,94	36,35	35,11	29,46	23,44	16,35	7,50	3,42	8,37
Mean CB	103	104	106	107	109	117	125	131	141	149	150
SEM	14,65	11,68	13,72	15,42	15,31	16,47	17,30	19,38	21,49	22,11	21,24
Mean AIB	131	130	131	133	136	140	148	150	155	157	142
SEM	46,53	47,88	48,73	49,04	48,53	49,10	48,60	46,53	45,80	44,40	40,43
Mean A	134	132	121	130	129	130	130	129	118	117	126
SEM	7,56	5,87	3,79	4,79	7,08	10,59	10,71	7,85	17,86	10,16	7,51
S. V. R. ([illegible])											
Mean AI	6,75	6,75	6,73	6,68	6,62	6,62	6,85	6,80	6,80	6,88	6,93
SEM	1,75	1,57	1,43	1,28	1,20	1,46	1,54	1,41	1,20	1,31	1,05
Mean AB	5,72	5,71	5,74	5,87	6,15	6,50	6,62	7,34	7,67	7,91	7,94
SEM	1,29	1,28	1,27	[illegible]	1,31	1,28	1,25	1,59	1,55	1,24	1,45
Mean CB	7,04	6,95	6,85	6,75	6,47	6,25	6,13	6,16	6,25	6,28	6,37
SEM	2,86	2,86	2,61	2,43	2,01	1,43	1,06	0,74	0,75	0,74	0,83
Mean AIB	6,06	6,13	6,14	6,08	6,04	6,25	6,71	6,96	7,25	7,94	7,20
SEM	1,04	0,90	0,85	0,79	0,86	1,06	0,90	0,95	0,96	1,56	1,90
Mean A	6,79	6,82	6,85	6,89	7,06	7,16	7,21	7,20	7,78	7,31	6,72
SEM	0,96	0,94	0,90	0,94	0,96	1,00	1,04	1,04	1,61	0,96	1,03
R. B. F. ([illegible])											
Mean AI	898	913	914	908	909	924	935	955	958	993	1000
SEM	49,89	52,95	58,18	57,47	90,37	127,50	151,20	182,81	181,94	204,84	199,26
Mean AB	509	499	497	501	506	544	606	646	688	731	746
SEM	100,66	96,23	96,33	89,47	83,19	56,92	38,29	73,64	110,89	159,95	189,93
Mean CB	603	621	631	630	624	637	651	682	739	790	839
SEM	68,89	89,23	106,17	110,02	107,41	105,30	94,55	56,98	38,38	57,25	112,86
Mean AIB	520	534	556	586	657	728	773	807	809	898	919
SEM	287,03	312,01	312,70	319,42	326,73	323,97	300,40	171,04	126,56	86,08	50,46
Mean A	742	743	747	747	746	745	746	745	741	740	741
SEM	25,14	23,73	21,85	19,97	19,24	17,89	11,51	15,81	13,42	28,22	13,42
R. V. R. ([illegible])											
Mean AI	109	108	108	108	107	106	104	103	101	98	98
SEM	13,17	12,19	11,29	12,14	19,24	20,73	23,29	25,82	28,03	22,33	22,75
Mean AB	134	136	137	139	142	145	147	153	158	158	159
SEM	20,37	18,04	13,14	12,16	14,09	18,67	25,80	35,59	44,17	50,98	58,13
Mean CB	130	128	128	129	131	132	130	127	122	119	115
SEM	39,39	41,82	44,52	46,70	44,75	40,33	31,95	22,06	18,76	17,07	20,51
Mean AIB	224	242	251	236	211	177	153	131	130	125	122
SEM	143,97	180,87	209,85	202,89	177,93	122,48	67,08	23,20	6,55	2,79	4,47
Mean A	136	136	137	137	137	137	136	133	131	126	120
SEM	10,95	10,50	10,34	10,57	11,08	12,62	15,21	18,78	19,80	19,95	21,94

AI:anesth+injured; AB:anesth+bled;CB:concious bled;AIB:anesth+injured+bled;A:anesth.

time (min)	-30	-15	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
Ratio PVR/SVR																			
Mean AI	18,93	18,29	18,25	18,46	18,08	17,38	16,77	16,51	16,12	16,10	16,30	16,66	16,73	17,09	17,13	17,24	17,06	16,94	16,83
SEM	3,26	3,47	3,62	4,34	4,60	3,62	3,67	3,54	3,64	3,55	3,31	3,92	3,68	3,77	3,76	3,66	3,37	3,26	3,21
Mean AB	15,64	15,62	15,73	15,30	15,13	15,24	15,39	15,68	16,22	17,09	17,92	18,73	19,57	20,65	21,40	22,02	22,98	23,59	23,77
SEM	0,85	1,16	1,39	1,96	2,67	3,32	3,46	3,52	4,17	4,18	4,31	4,67	4,92	4,98	5,73	5,84	5,61	5,72	6,07
Mean CB	17,88	17,64	17,44	17,09	16,54	16,57	16,95	17,39	17,62	18,45	19,46	20,43	21,41	22,10	22,71	22,77	22,21	21,40	20,98
SEM	0,96	0,73	0,71	1,08	1,39	1,46	1,69	2,29	3,29	4,55	6,20	7,09	7,97	8,09	8,80	8,96	8,39	8,03	8,26
Mean AIB	19,23	20,02	21,23	22,03	22,15	21,95	21,47	19,87	19,60	19,93	20,40	20,59	21,65	23,12	24,63	26,06	27,76	30,12	32,96
SEM	3,76	5,42	7,52	8,97	9,73	10,08	10,47	9,41	10,09	11,46	12,36	11,86	11,49	11,12	10,17	9,84	10,21	11,79	14,90
Mean A	17,81	20,21	20,27	20,36	20,26	20,35	20,52	20,56	20,71	20,77	20,81	20,73	20,72	20,64	20,49	20,51	20,48	20,48	20,48
SEM	2,17	2,10	2,34	2,10	1,93	2,02	2,17	2,36	2,54	2,54	2,82	2,91	2,83	2,73	2,61	2,36	2,08	1,94	1,89
Ratio SV/CVP																			
Mean AI	24,65	24,64	25,30	26,66	28,42	33,00	37,46	39,95	40,29	39,84	39,68	40,37	40,92	41,08	41,24	41,58	41,60	42,52	42,58
SEM	2,67	2,93	4,69	6,63	8,70	11,34	14,39	14,44	14,36	13,72	13,80	13,80	13,14	12,45	12,10	10,35	9,80	9,03	8,42
Mean AB	26,04	26,11	26,15	26,18	23,16	20,52	20,84	20,97	21,55	21,35	20,73	25,61	24,93	24,34	24,66	25,73	26,22	26,17	26,61
SEM	2,91	3,41	4,03	5,27	6,37	8,73	9,98	11,04	12,33	13,53	14,35	14,67	15,28	15,38	15,98	16,75	16,61	16,32	17,03
Mean CB	28,79	28,28	28,14	28,72	28,92	30,57	33,14	34,02	35,05	35,08	35,02	33,81	35,61	35,13	35,12	35,43	37,53	37,55	39,20
SEM	1,63	3,45	4,30	6,01	8,45	10,34	12,59	12,14	12,20	11,34	10,88	9,12	10,94	10,07	9,85	10,37	11,15	11,94	13,54
Mean AIB	31,96	33,86	36,56	39,57	41,02	42,13	43,57	42,52	44,87	47,01	49,46	50,50	52,57	54,27	57,66	60,93	63,53	65,34	70,15
SEM	10,43	13,71	18,14	25,40	29,39	30,27	30,75	29,27	31,82	34,79	37,05	37,09	37,17	36,20	34,53	29,25	27,04	24,95	30,27
Mean A	25,84	22,67	23,14	23,06	22,80	22,67	23,67	23,98	24,11	24,08	23,78	22,84	22,79	22,92	23,34	24,26	25,03	25,31	25,70
SEM	6,50	4,67	5,00	7,24	5,84	4,89	5,68	5,91	5,93	5,99	5,72	5,10	4,65	4,72	4,91	4,28	3,74	3,26	3,36

AI:anesth+injured; AB:anesth+bled;CB:concious bled;AIB:anesth+injured+bled;A:anesth

time (min)	80	85	90	105	120	180	360	1440	2880	4320	5760
Ratio RVRV/PVR											
Mean AI	16,74	16,41	16,21	16,31	16,61	16,74	16,13	15,92	15,51	15,03	14,95
SEM	3,10	2,96	2,95	3,21	4,01	5,32	5,99	5,98	5,80	6,02	5,14
Mean AB	24,10	24,65	24,76	24,36	23,60	22,57	22,39	20,84	20,24	19,65	19,69
SEM	5,37	5,42	5,32	4,54	3,69	2,52	2,18	2,35	2,94	3,96	4,36
Mean CB	19,98	19,66	20,00	20,42	21,22	21,72	21,67	20,65	19,63	18,93	18,02
SEM	7,46	7,43	6,67	9,23	9,02	8,39	6,63	3,25	2,26	1,72	1,76
Mean AIB	36,77	39,53	41,34	39,25	36,51	29,05	23,58	19,14	18,24	18,22	18,08
SEM	21,55	28,53	34,90	34,54	30,66	20,95	12,20	4,98	3,34	3,13	2,74
Mean A	20,51	20,39	20,19	19,82	19,63	19,36	19,05	18,56	17,18	17,37	18,78
SEM	1,76	1,65	1,55	1,65	1,83	1,97	2,23	2,40	3,31	2,66	1,32
Ratio SVECVP											
Mean AI	43,70	43,72	45,21	47,57	51,57	49,01	50,07	47,91	45,17	43,69	43,44
SEM	9,09	8,51	10,09	13,26	17,93	14,84	16,45	16,24	14,59	14,73	13,58
Mean AB	25,64	24,64	24,17	23,69	21,81	20,02	19,56	19,36	18,73	19,96	19,63
SEM	15,83	15,03	14,95	14,80	12,97	9,41	6,54	3,90	1,51	1,48	2,46
Mean CB	40,72	42,18	42,76	42,76	37,72	35,11	33,33	32,17	32,72	33,71	34,66
SEM	16,69	19,46	21,43	23,34	17,05	14,01	10,36	9,04	8,73	9,25	9,73
Mean AIB	69,90	76,20	66,94	119,80	107,42	71,97	69,68	75,76	92,02	123,38	43,12
SEM	33,11	45,82	66,87	124,50	85,10	21,14	31,25	62,58	110,85	189,79	20,85
Mean A	25,51	25,75	25,56	25,36	25,25	24,94	25,35	22,52	24,58	22,70	23,22
SEM	3,53	3,72	4,30	5,28	6,05	6,49	7,42	8,38	8,84	6,25	4,51

time (min)	-30	-15	-5	9	19	31	44	60	120	180	360	1440	2880	4320	
[illegible]															
Mean AI	4,62	6,36	7,14	6,96	5,68	6,28	6,46	6,42	4,10	4,52	3,90	2,70	3,12	1,64	
SEM	3,49	4,32	4,09	4,25	2,86	2,84	4,27	4,11	2,11	1,27	1,80	1,52	1,64	0,49	
Mean AB	2,56	1,50	1,43	2,36	2,78	4,48	8,03	7,08	5,58	4,68	2,20	3,88	5,40	3,10	
SEM	1,05	1,06	1,05	1,30	2,21	4,36	5,89	5,32	3,80	3,88	0,98	2,99	4,58	1,57	
Mean CB	2,36	2,14	1,68	2,04	2,84	2,62	2,90	3,58	2,68	2,72	4,26	2,46	1,68	2,34	
SEM	0,89	0,54	0,70	0,57	1,95	2,17	1,34	2,48	1,37	0,90	4,40	1,24	0,31	1,40	
Mean AIB	3,92	3,64	4,78	4,80	5,90	5,40	8,34	7,80	9,10	3,08	2,45	3,74	2,40	1,64	
SEM	1,77	2,04	1,98	2,01	3,22	4,42	6,56	5,09	10,68	2,05	0,64	3,13	2,26	0,96	
Mean A	3,12	4,41	3,21	2,45	1,41	0,90	1,28	2,12	3,01	2,15	3,23	4,10	1,21	0,95	
SEM	1,24	1,36	2,14	1,05	0,98	1,01	1,21	1,74	1,85	1,53	1,24	2,13	1,07	0,87	
[illegible]															
Mean AI	4,80	4,94	4,32	5,46	5,82	4,68	3,82	4,02	5,90	4,66	6,76	2,78	4,42	2,88	
SEM	2,62	2,62	3,25	3,47	4,98	3,62	1,85	2,35	4,95	2,63	4,85	1,26	3,04	2,31	
Mean AB	6,80	5,54	5,76	5,62	5,30	6,80	6,92	6,90	7,46	11,02	4,30	3,39	3,68	4,52	
SEM	3,10	3,18	5,50	4,47	4,39	3,58	2,40	3,18	5,09	8,30	1,13	2,00	1,70	2,18	
Mean CB	4,26	4,16	3,84	3,26	3,66	4,44	5,08	4,78	4,76	6,04	5,24	5,47	4,35	6,09	
SEM	2,29	2,66	2,20	1,79	2,41	3,01	3,15	2,16	2,21	2,53	3,01	3,69	2,26	3,05	
Mean AIB	6,38	7,26	6,78	6,34	6,34	5,80	7,50	6,74	6,56	8,42	7,46	5,34	4,90	9,82	
SEM	6,99	5,95	4,50	3,83	5,29	2,44	5,81	4,92	4,66	5,44	5,10	4,15	2,81	4,38	
Mean A	5,12	5,23	4,52	4,58	4,39	8,01	5,27	4,93	3,73	4,26	3,24	3,78	4,19	3,12	
SEM	2,40	2,34	1,85	1,96	2,21	3,01	2,74	2,32	1,96	2,36	1,97	1,66	2,01	2,37	
[illegible]															
Mean AI	0,91	0,91	0,90	0,96	1,03	0,90	0,91	0,94	0,88	0,94	1,11	1,08	1,07	0,97	
SEM	0,12	0,09	0,09	0,07	0,23	0,09	0,13	0,14	0,12	0,10	0,27	0,19	0,15	0,15	
Mean AB	0,98	0,96	0,95	1,03	1,07	1,08	1,14	1,29	1,32	1,16	1,15	1,07	0,97	0,95	
SEM	0,19	0,17	0,13	0,19	0,27	0,28	0,38	0,42	0,43	0,16	0,13	0,19	0,08	0,06	
Mean CB	0,84	0,83	0,88	0,88	0,88	0,92	0,89	0,89	0,88	0,91	0,94	0,96	0,89	0,96	
SEM	0,20	0,17	0,16	0,17	0,18	0,19	0,19	0,18	0,21	0,21	0,19	0,20	0,16	0,10	
Mean AIB	0,73	0,74	0,80	0,83	0,88	0,93	0,91	0,93	0,94	0,96	1,06	1,20	1,10	1,00	
SEM	0,13	0,14	0,21	0,23	0,28	0,27	0,23	0,25	0,22	0,30	0,23	0,10	0,22	0,09	
Mean A	0,86	0,92	0,93	0,86	0,88	0,90	0,90	0,90	0,87	0,85	0,89	0,84	0,84	0,91	
SEM	0,13	0,10	0,09	0,09	0,10	0,05	0,11	0,15	1,01	0,08	0,10	0,08	0,08	0,14	
[illegible]															
Mean AI	52,22	54,44	57,02	58,80	58,80	57,90	56,34	59,06	61,74	58,80	58,98	57,18	57,60	57,66	
SEM	15,11	14,10	16,20	11,46	14,05	12,42	16,18	14,04	14,58	17,56	18,44	19,82	19,65	17,67	
Mean AB	59,13	61,55	94,33	61,56	56,03	54,45	53,23	53,60	52,90	56,13	49,65	53,10	51,60	52,78	
SEM	20,37	23,79	26,51	16,95	15,66	14,34	11,78	14,10	15,29	11,02	8,96	6,37	7,31	6,57	
Mean CB	58,94	53,66	55,94	56,28	58,64	54,66	61,50	63,50	57,66	53,00	53,60	59,00	56,92	57,32	
SEM	17,36	16,70	16,10	13,66	11,99	14,14	11,53	15,05	12,17	16,55	15,25	13,73	11,90	10,49	
Mean AIB	49,53	69,18	70,60	69,00	75,80	77,60	80,33	79,30	88,63	100,80	95,04	88,44	81,44	76,52	
SEM	2,66	23,07	27,02	20,02	25,56	28,41	37,17	35,07	53,03	74,42	63,10	56,28	51,74	60,70	
Mean A	57,00	57,20	60,10	57,65	58,25	57,10	58,56	58,06	56,30	58,50	59,50	58,50	60,40	59,30	
SEM	13,32	14,25	10,52	11,20	17,52	16,34	12,78	14,20	10,46	11,78	12,85	13,47	15,23	12,63	

AI:anesth+injured; AB:anesth+bled; CB:conscious+bled; AIB:anesth+injured+bled; A:anesth.

time (min)	-30	-15	-5	9	19	31	44	60	120	180	360	1440	2880	4320	5760
[illegible]															
Mean AI	0,33	0,26	0,29	0,29	0,30	0,29	0,27	0,34	0,31	0,26	0,26	0,30	0,30	0,35	0,3[illegible]
SEM	0,09	0,05	0,12	0,09	0,16	0,11	0,06	0,09	0,10	0,08	0,09	0,06	0,06	0,08	0,0[illegible]
Mean AB	0,36	0,37	0,36	0,38	0,37	0,37	0,36	0,38	0,37	0,39	0,40	0,42	0,39	0,36	0,3[illegible]
SEM	0,09	0,11	0,10	0,10	0,09	0,08	0,08	0,10	0,12	0,14	0,14	0,15	0,11	0,08	0,0[illegible]
Mean CB	0,30	0,32	0,32	0,31	0,34	0,32	0,33	0,33	0,33	0,31	0,35	0,37	0,39	0,43	0,4[illegible]
SEM	0,12	0,13	0,13	0,13	0,13	0,12	0,13	0,13	0,15	0,14	0,16	0,21	0,21	0,20	0,16
Mean AIB	0,30	0,30	0,31	0,30	0,32	0,31	0,32	0,31	0,33	0,34	0,38	0,39	0,41	0,44	0,45
SEM	0,09	0,11	0,13	0,12	0,11	0,11	0,10	0,12	0,15	0,15	0,13	0,11	0,14	0,16	0,16
Mean A	0,25	0,22	0,22	0,24	0,22	0,23	0,22	0,23	0,22	0,23	0,25	0,26	0,24	0,22	0,20
SEM	0,12	0,09	0,09	0,10	0,11	0,09	0,09	0,08	0,07	0,08	0,09	0,06	0,07	0,09	0,10
[illegible]															
Mean AI	13,14	14,12	13,92	14,50	14,53	14,46	14,34	14,13	14,61	14,41	14,63	14,93	14,87	14,59	14,70
SEM	3,56	4,36	3,56	3,93	4,08	3,95	3,94	3,49	3,37	3,38	3,39	3,86	3,94	2,46	1,77
Mean AB	13,99	14,52	13,97	14,06	14,09	14,62	14,38	14,42	16,01	17,09	17,49	14,07	13,94	13,47	13,72
SEM	3,97	3,74	3,30	3,50	3,42	3,32	3,72	3,33	4,28	2,95	2,89	1,56	2,80	3,26	2,35
Mean CB	14,19	14,78	14,78	14,76	15,00	15,50	15,13	15,40	15,30	15,78	16,00	16,25	15,61	15,81	14,70
SEM	2,02	2,29	1,66	1,52	2,23	1,94	1,91	2,01	2,10	2,22	2,91	1,90	2,10	1,67	1,96
Mean AIB	13,72	14,12	15,90	15,54	16,16	16,02	16,49	16,36	17,43	19,53	18,65	16,70	18,66	17,06	17,45
SEM	2,86	2,39	3,13	2,73	3,60	3,26	4,03	3,67	4,36	7,80	7,27	6,31	7,07	6,07	6,40
Mean A	14,80	14,90	15,10	15,20	14,90	15,36	15,29	15,11	14,31	14,32	14,60	13,93	14,40	14,21	13,64
SEM	2,80	3,21	2,26	2,50	1,56	2,46	2,63	3,01	3,56	2,47	1,96	3,12	3,03	2,41	3,04
[illegible]															
Mean AI	48,70	47,56	47,12	46,64	47,62	46,38	46,56	47,48	47,90	50,26	49,78	50,18	50,46	53,11	58,24
SEM	4,30	4,10	4,01	2,66	3,12	3,85	2,85	2,58	4,49	6,82	6,4863	5,60	5,97	6,17	4,59
Mean AB	55,60	54,63	55,18	53,88	50,78	51,48	52,41	51,48	51,94	58,22	56,888	58,54	57,03	59,64	57,86
SEM	10,51	10,47	8,98	10,19	11,23	11,53	10,58	11,15	13,36	9,16	11,564	9,95	10,01	8,18	6,90
Mean CB	68,25	65,80	67,16	65,15	64,35	63,84	63,62	61,61	61,61	61,46	62,1	63,22	58,24	57,24	55,78
SEM	12,67	12,18	9,88	9,62	8,78	7,37	8,58	9,91	10,97	10,67	10,507	9,93	9,15	7,41	8,78
Mean AIB	58,59	58,08	58,62	54,40	59,18	58,79	58,63	55,89	58,51	58,82	55,48	59,54	58,42	60,74	61,70
SEM	14,63	13,40	13,53	10,80	9,91	10,21	10,45	11,07	12,12	11,45	11,788	13,92	13,98	20,48	23,55
Mean A	65,25	66,90	67,56	66,25	67,66	67,25	66,75	65,06	67,06	67,90	62,41	65,78	63,12	66,23	65,10
SEM	12,20	10,41	9,71	5,32	5,56	9,23	8,74	8,63	4,68	8,52	6,47	6,96	10,41	9,64	8,52
[illegible]															
Mean AI	828	826	824	837	906	851	839	857	805	859	858	908	919	835	813
SEM	329	383	339	360	324	315	327	310	253	324	375	300	325	347	341
Mean AB	1027	983	956	1028	1012	983	949	956	931	992	1036	1015	1013	977	942
SEM	368	4[illegible]5	466	[illegible]79	461	442	454	494	466	424	450	488	497	470	493
Mean CB	810	783	757	[illegible]60	785	786	772	775	749	715	731	741	703	644	708
SEM	248	184	178	129	117	135	169	189	184	188	187	187	186	153	130
Mean AIB	583	639	701	633	714	684	654	656	726	749	748	1000	991	863	809
SEM	242	210	177	219	211	241	347	373	246	250	239	84	75	188	196
Mean A	901	867	880	860	856	851	864	852	849	851	861	843	864	854	849
SEM	310	341	311	421	305	386	345	381	371	413	423	345	321	332	352

AI anesth+injured; AB anesth.+bled, CB conscious bled; AIB anesth +injured+bled, A anesth

time (min)	-30	-15	-5	9	19	31	44	60	120	180	360	1440	2880	4320	5760
[illegible]															
Mean AS	72,10	74,14	75,06	75,34	75,06	74,66	75,82	77,36	78,62	75,62	79,94	81,12	78,68	70,78	70,91
SEM	17,79	11,33	12,13	14,13	15,53	14,82	17,28	13,19	14,56	14,48	12,78	10,73	6,88	15,16	17,63
Mean AB	79,73	79,32	73,32	76,30	78,56	78,66	78,92	74,64	76,18	83,80	88,32	86,12	86,74	86,62	87,04
SEM	35,47	35,32	28,70	30,09	31,16	31,09	30,63	27,37	29,10	33,85	37,83	38,78	31,24	33,22	37,24
Mean CB	75,62	79,56	83,20	83,20	83,06	84,73	84,04	82,07	80,77	85,61	83,04	86,90	74,36	74,52	79,68
SEM	16,40	16,60	16,46	16,25	15,15	15,73	15,97	17,46	19,78	21,12	32,15	30,30	14,82	12,38	18,85
Mean ASB	55,80	51,43	52,73	50,69	52,49	53,38	53,81	56,97	42,38	46,53	50,78	75,63	65,65	59,08	57,05
SEM	11,63	16,14	14,30	15,70	12,84	10,02	8,90	9,88	22,69	16,09	20,99	35,76	23,77	21,08	24,88
Mean A	72,70	72,49	68,33	70,54	75,87	74,80	73,13	74,13	72,67	72,06	74,63	76,21	74,14	73,48	71,22
SEM	8,81	10,62	13,12	17,32	16,79	12,45	14,44	13,46	20,32	13,11	15,24	19,83	17,68	20,12	19,77
[illegible]															
Mean AS	16,08	15,78	17,54	17,09	18,10	17,19	17,00	17,10	18,16	19,96	23,46	28,50	27,60	27,83	29,27
SEM	1,82	4,29	6,10	4,67	5,80	6,30	4,77	6,03	5,67	5,70	8,56	13,07	9,62	12,64	14,45
Mean AB	24,14	25,38	25,38	25,20	25,39	24,95	23,76	23,97	22,68	22,94	26,08	26,04	24,88	26,08	25,40
SEM	23,43	24,14	24,33	25,17	22,33	20,48	20,66	20,46	19,19	16,99	18,84	21,22	20,39	20,85	20,32
Mean CB	19,16	18,44	18,86	18,25	18,49	18,04	18,67	18,52	19,80	19,79	20,01	14,22	15,66	15,50	14,75
SEM	4,17	3,93	5,43	4,93	4,11	3,77	4,46	4,44	5,31	7,89	10,20	4,04	3,37	2,78	4,82
Mean ASB	15,54	18,09	13,73	14,20	14,02	14,63	14,92	16,00	20,15	21,11	20,74	31,78	32,52	31,64	32,05
SEM	7,39	12,46	4,50	6,23	4,91	4,41	5,76	6,73	10,47	12,60	11,86	17,86	19,76	19,09	21,93
Mean A	16,16	13,1	11,7	12,01	12,43	11,92	11,66	12,3	12,8	13,4	14,21	15,23	16,44	12,34	11,09
SEM	4,63	4,79	5,36	6,01	6,32	5,24	5,08	4,93	5,73	5,27	6,01	6,66	7,01	6,03	5,66
[illegible]															
Mean AS	25,14	28,21	25,62	27,00	28,66	29,36	31,86	32,22	32,84	33,16	32,46	32,58	31,80	31,84	29,80
SEM	9,81	7,83	8,83	11,02	11,91	16,47	17,51	18,85	19,40	19,71	16,77	19,20	16,53	14,73	12,42
Mean AB	59,47	61,17	55,31	57,39	59,40	58,64	58,09	56,16	55,43	58,25	61,70	58,28	56,68	57,56	56,18
SEM	32,86	35,26	32,02	31,36	30,56	29,74	29,12	29,81	27,88	25,85	27,89	27,61	27,28	27,86	27,27
Mean CB	49,05	49,80	47,88	49,21	49,41	49,77	48,86	45,66	44,72	43,11	41,51	41,17	30,96	31,00	27,96
SEM	18,07	19,16	17,45	19,15	19,82	19,36	19,63	19,06	17,89	18,31	17,32	17,65	19,28	10,27	11,35
Mean ASB	24,49	21,23	26,75	30,25	32,41	34,09	36,31	23,30	24,26	28,09	25,61	32,80	35,90	35,76	34,23
SEM	6,73	3,08	9,85	12,66	15,70	23,01	28,44	3,28	4,16	3,86	2,65	6,71	11,63	12,71	14,20
Mean A	32,81	34,30	35,05	31,17	34,70	37,00	38,10	33,50	32,65	35,40	33,09	29,79	28,34	30,24	31,29
SEM	5,60	4,63	7,63	7,21	9,37	5,31	8,48	10,79	16,32	12,44	6,76	16,32	17,46	6,98	7,83
[illegible]															
Mean AS	486	509	492	497	541	570	662	728	932	1180	1388	1905	1380	1078	868
SEM	134	148	156	135	103	58	379	400	487	774	606	850	693	610	371
Mean AB	822	813	788	786	812	789	746	739	704	793	913	1070	1060	977	948
SEM	629	683	659	662	637	616	577	547	512	537	619	1101	1219	1112	1027
Mean CB	580	614	494	494	536	488	480	478	460	468	481	428	422	309	357
SEM	454	378	333	375	439	320	386	395	343	326	402	309	382	101	182
Mean ASB	575	492	445	461	466	440	421	442	492	571	713	2816	2276	1467	1466
SEM	570	457	421	315	414	319	272	281	188	207	185	1980	1737	975	1385
Mean A	309	337	422	337	471	470	456	395	273	194	221	234	306	485	432
SEM	189	258	397	273	471	463	457	382	180	56	186	134	107	208	227

AI:anesth+injured; AB:anesth+bled; CB:conscious+bled; AIB:anesth+injured+bled; A:anesth

time (min)	-30	-15	-5	9	19	31	44	80	120	180	300	1440	2880	4320	5760
[illegible]															
Mean AI	136	136	136	136	136	136	136	136	139	137	137	136	139	139	136
SEM	3,04	3,13	3,70	3,54	3,54	3,51	4,12	3,70	3,71	4,27	4,51	4,44	6,61	3,70	3,91
Mean AB	139	138	136	137	136	137	138	138	137	137	137	136	137	137	139
SEM	2,00	1,22	1,30	1,84	1,22	1,84	1,52	1,52	1,84	1,30	2,30	2,83	2,92	2,19	1,84
Mean CB	137	137	137	136	136	136	139	137	138	138	138	137	137	135	135
SEM	2,87	2,38	2,59	2,07	2,00	2,87	1,85	2,07	2,17	2,30	1,30	2,41	2,30	3,08	3,11
Mean AIB	134	133	134	133	132	133	134	134	134	139	132	133	135	137	140
SEM	4,84	4,83	4,39	5,54	5,80	4,22	3,64	3,98	4,66	6,20	7,13	4,87	5,03	3,39	6,89
Mean A	139	139	140	139	140	141	139	139	139	139	140	141	139	138	139
SEM	3,54	2,69	2,12	2,78	2,71	2,71	2,89	3,64	2,83	2,88	3,01	2,58	3,11	2,78	3,25
[illegible]															
Mean AI	1	101	102	102	102	102	102	102	102	102	101	102	102	102	103
SEM	5,41	5,22	4,83	4,82	4,8	4,86	5,22	5,22	5,24	5,28	5,28	6,83	7,84	4,34	5,77
Mean AB	102	103	103	103	104	104	105	105	102	102	101	101	100	100	102
SEM	2,70	2,39	2,59	2,59	3,08	3,35	4,34	3,35	4,08	3,44	2,88	2,49	3,06	2,17	1,84
Mean CB	100	101	100	100	100	101	100	100	100	101	100	98	99	97	98
SEM	3,29	3,05	3,44	3,44	3,27	3,09	3,05	2,86	3,51	3,70	3,10	2,29	2,95	5,08	6,14
Mean AIB	99	100	100	100	100	101	101	101	100	97	98	99	99	101	103
SEM	2,30	1,30	1,59	2,35	2,89	2,07	1,48	1,98	1,52	6,03	3,27	2,97	3,03	4,04	6,91
Mean A	97	97	97	96	99	99	96	99	99	99	99	100	101	99	99
SEM	2,41	2,51	1,91	2,12	2,31	1,41	2,63	2,16	3,41	1,41	2,21	2,45	1,83	3,11	2,73
[illegible]															
Mean AI	4,06	3,73	3,83	3,72	3,73	3,70	3,78	3,78	3,84	3,82	4,11	3,78	3,75	3,82	3,76
SEM	0,59	0,56	0,62	0,52	0,58	0,56	0,55	0,62	0,58	0,76	0,89	0,33	0,29	0,22	0,25
Mean AB	4,01	3,85	3,81	3,73	3,70	3,81	3,84	3,89	3,71	3,81	4,04	3,85	3,88	3,76	3,75
SEM	0,57	0,63	0,64	0,69	0,67	0,72	0,77	0,76	0,72	0,68	0,72	0,64	0,62	0,60	0,65
Mean CB	3,89	3,48	3,44	3,58	3,64	3,62	3,63	3,85	3,81	3,73	4,01	3,88	3,88	3,67	3,66
SEM	0,34	0,27	0,27	0,30	0,38	0,31	0,28	0,15	0,38	0,37	0,44	0,30	0,42	0,49	0,48
Mean AIB	3,78	3,49	3,48	3,41	3,36	3,33	3,36	3,89	3,47	3,82	4,08	4,08	3,75	3,83	3,86
SEM	0,48	0,44	0,34	0,39	0,33	0,30	0,21	0,36	0,31	0,44	0,62	0,63	0,36	0,21	0,62
Mean A	3,57	3,27	3,12	3,09	3,04	3,53	3,53	3,12	3,38	3,36	3,42	3,48	3,44	3,21	3,06
SEM	0,34	0,17	0,22	0,17	0,13	0,21	1,44	0,67	0,18	0,21	0,32	0,66	0,22	0,32	0,12
[illegible]															
Mean AI	22,7	22,3	22,2	21,4	21,9	21,9	21,5	22,0	22,6	22,1	22,2	23,2	23,7	21,5	22,3
SEM	8,58	8,42	8,04	8,06	8,32	8,25	7,39	7,14	7,74	8,75	8,41	7,66	8,63	7,36	6,50
Mean AB	20,0	19,3	20,1	19,2	19,0	19,1	20,3	19,6	19,8	20,6	20,7	22,6	20,5	20,0	20,0
SEM	5,44	4,69	4,76	4,58	5,39	5,01	4,69	4,21	4,93	3,68	4,46	3,69	4,53	4,86	5,49
Mean CB	14,5	15,1	14,9	15,0	15,5	15,1	15,9	15,0	15,8	16,3	15,2	16,1	15,7	16,3	16,9
SEM	3,83	4,08	3,21	2,94	2,94	2,87	2,49	3,38	3,69	3,09	2,89	2,36	3,29	4,12	4,38
Mean AIB	20,5	22,4	20,3	19,1	20,0	20,6	21,8	21,6	23,3	23,7	21,9	20,6	22,7	21,6	23,5
SEM	2,83	4,98	2,59	0,91	3,86	2,39	4,76	4,34	6,98	6,93	3,89	6,97	6,76	4,53	6,17
Mean A	19,6	19,2	19,9	19,0	20,7	20,5	20,3	20,4	21,9	21,8	20,6	20,3	21,2	21,5	22,0
SEM	3,16	5,69	5,22	1,70	3,79	3,42	6,86	7,36	7,78	8,34	6,12	6,22	4,34	6,16	5,82

AI anesth+injured; AB anesth+bled; CB conscious+bled; AIB anesth+injured+bled; A anesth

time (min)	-30	-15	-5	9	19	31	44	60	120	180	300	1440	2880	4320	5760
Mean AI	101	94	96	96	97	99	99	99	101	101	102	102	102	104	103
SEM	12,34	14,11	13,28	12,76	15,17	16,91	15,79	16,12	14,90	12,85	15,11	11,50	11,44	13,07	16,63
Mean AB	91	90	89	92	97	91	89	88	85	93	91	91	91	90	94
SEM	14,78	16,24	13,90	14,97	14,44	13,28	12,54	11,84	12,12	14,92	12,97	12,31	14,52	16,06	17,66
Mean CB	86	87	89	91	90	93	93	92	90	91	92	94	95	91	94
SEM	9,17	8,12	4,63	7,31	5,31	7,73	8,21	5,35	9,11	8,74	9,28	9,71	10,51	10,21	9,97
Mean AIB	87	87	86	83	82	82	91	86	86	86	86	87	90	95	96
SEM	11,18	12,20	12,24	9,37	10,28	8,33	7,27	8,23	9,19	8,48	8,92	11,83	10,26	17,26	18,27
Mean A	94	94	91	86	90	90	89	92	98	96	93	94	92	89	87
SEM	12,404	10,081	8,3263	9,2831	8,8284	6,3536	6,7778	9,7378	10,233	13,98	12,11	13,78	9,65	8,75	7,55
Glycolytic															
Mean AI	294	291	292	292	292	294	293	293	294	295	296	296	296	296	295
SEM	11,98	10,69	10,80	9,67	11,31	11,09	11,84	10,89	11,83	11,34	11,87	11,82	11,12	11,80	10,79
Mean AB	299	298	298	297	295	300	301	300	300	299	297	297	299	300	302
SEM	31,91	34,48	32,35	30,23	31,67	33,74	34,84	33,38	33,19	30,15	30,98	33,85	30,88	33,11	31,46
Mean CB	290	291	292	290	293	293	291	291	289	291	291	290	292	290	291
SEM	11,90	10,12	11,42	12,40	10,56	10,68	11,28	9,53	9,59	10,46	7,42	5,82	7,09	6,76	9,10
Mean AIB	293	292	293	294	293	294	293	294	295	297	297	299	299	299	298
SEM	2,63	2,61	4,12	3,53	2,56	2,63	2,68	1,73	1,69	2,22	3,11	4,24	4,65	10,71	17,58
Mean A	294	294	295	295	295	294	295	296	295	297	296	292	296	297	295
SEM	10,71	11,41	10,97	12,12	14,25	13,54	10,91	12,12	14,14	15,65	15,13	17,20	13,54	12,56	14,20

AI:anesth+injured; AB:anesth+bled; CB:conscious bled; AIB:anesth+injured+bled; A:anesth

time (min)	-30	-15	-6	9	16	31	44	60	120	180	360	1440	2880	4320	5760
[illegible]															
Mean AB	5,40	5,04	4,81	4,94	4,82	4,92	4,81	4,76	4,96	4,80	4,88	4,40	4,25	3,99	3,99
SEM	1,08	1,07	1,09	1,08	1,14	1,09	0,94	0,97	1,07	0,96	0,78	0,77	0,47	0,58	0,64
Mean AB	4,76	4,48	4,34	4,44	4,37	4,12	4,07	4,01	3,99	3,88	3,76	3,39	3,27	3,23	3,35
SEM	1,14	1,14	0,94	0,98	1,00	1,08	1,02	1,10	1,03	0,89	0,87	0,84	0,61	0,40	0,40
Mean CB	5,63	5,19	5,23	5,26	5,25	5,12	5,02	4,92	4,84	4,40	4,21	3,83	3,54	3,66	3,60
SEM	0,82	0,83	0,80	0,87	0,79	0,72	0,73	0,69	0,89	0,86	0,82	0,33	0,35	0,30	0,32
Mean AIB	4,83	4,39	4,24	4,17	4,13	3,98	3,94	3,91	3,88	3,88	3,89	3,50	3,46	3,22	3,28
SEM	1,48	0,76	0,78	0,77	0,76	0,78	0,77	0,79	0,81	0,78	0,85	0,83	0,41	0,52	0,75
Mean A	5,36	5,22	5,11	5,07	5,13	5,17	5,13	5,02	5,19	5,37	5,35	5,23	5,34	5,24	5,15
SEM	0,90	0,81	0,83	0,47	0,48	0,57	0,57	0,66	0,68	0,25	0,53	0,85	0,56	0,63	0,41
[illegible]															
Mean AB	17,7	14,8	14,4	15,8	16,1	16,6	17,1	16,8	17,5	17,8	16,8	16,1	19,7	17,6	15,3
SEM	6,63	3,46	3,21	3,31	3,83	5,20	6,42	6,51	6,24	5,75	6,32	1,80	3,46	6,03	3,38
Mean AB	21,9	16,4	16,7	21,7	22,2	21,7	22,2	22,6	24,0	26,2	27,9	22,2	23,7	21,9	22,9
SEM	6,68	4,31	3,70	7,14	7,72	7,98	8,68	8,85	8,04	11,12	13,26	6,93	6,45	6,15	10,46
Mean CB	20,6	20,2	19,8	18,9	19,8	19,2	18,5	18,2	20,4	20,4	20,2	20,1	21,3	20,0	20,5
SEM	6,56	5,75	5,00	4,85	4,80	4,54	4,63	4,67	7,56	6,20	3,85	3,00	1,82	1,70	5,89
Mean AIB	14,7	14,4	14,9	13,5	14,2	13,9	14,8	15,8	16,2	15,8	15,2	16,8	19,6	21,7	20,4
SEM	2,28	2,67	2,30	2,01	1,89	2,28	1,87	2,09	5,23	4,49	3,09	2,85	1,79	6,89	6,83
Mean A	20,3	22,7	22,0	21,7	19,5	19,1	19,6	23,0	21,5	22,3	23,2	20,8	18,6	17,6	18,3
SEM	1,26	4,31	2,28	1,89	5,37	4,53	1,83	4,89	3,04	1,98	3,46	6,74	3,85	6,41	4,95
[illegible]															
Mean AB	8,01	8,84	8,53	8,28	8,18	8,18	8,20	8,08	8,20	8,12	7,88	7,88	7,34	8,78	7,98
SEM	1,38	1,48	1,41	1,48	1,38	1,38	1,39	1,43	1,33	1,38	1,42	1,38	1,03	1,00	1,16
Mean AB	8,44	8,08	7,74	7,72	7,78	7,80	7,28	7,12	6,94	6,78	6,48	5,82	5,82	5,32	5,12
SEM	1,58	1,80	1,81	1,78	1,82	1,80	1,80	1,82	1,78	1,84	1,87	1,87	1,81	0,87	0,96
Mean CB	6,02	6,40	6,30	6,22	6,68	7,08	7,84	7,82	7,18	6,88	6,68	5,93	5,82	6,08	6,28
SEM	0,38	0,84	0,48	0,84	0,47	0,43	0,47	0,83	0,45	0,88	0,82	0,28	0,47	0,36	0,76
Mean AIB	7,24	6,94	6,88	6,86	6,78	6,46	6,34	6,26	6,14	6,12	5,88	5,84	5,84	5,32	5,34
SEM	1,58	1,29	1,30	1,40	1,29	1,38	1,30	1,31	1,20	1,15	0,80	0,91	0,64	0,72	1,14
Mean A	8,46	8,80	8,49	8,46	8,38	8,30	8,46	8,46	8,42	8,21	8,15	8,22	8,10	8,15	8,06
SEM	0,82	1,13	0,99	0,92	0,92	0,88	1,07	1,20	1,13	2,12	1,03	1,28	1,19	0,94	0,58
[illegible]															
Mean AB	28,1	27,8	28,0	27,2	26,5	27,0	26,3	26,3	26,5	26,3	26,3	24,2	23,5	22,1	22,4
SEM	4,58	5,07	5,17	5,52	6,08	6,06	4,23	4,83	5,14	4,68	3,64	4,52	3,39	2,89	3,19
Mean AB	27,1	26,4	26,1	26,4	25,7	25,3	24,8	24,6	24,7	23,7	23,0	19,7	19,0	19,0	19,9
SEM	5,01	4,20	3,90	4,34	3,82	3,89	3,89	3,86	3,85	3,89	4,16	2,32	2,57	1,25	1,83
Mean CB	20,4	20,8	20,6	20,6	20,7	20,3	20,0	20,0	24,2	22,6	21,8	19,6	18,4	19,5	20,0
SEM	4,28	2,85	2,11	1,89	4,08	3,84	3,69	3,62	4,26	2,49	2,86	1,80	1,79	1,22	2,60
Mean AIB	23,1	22,6	22,5	21,5	22,0	21,0	20,7	20,7	20,4	20,4	18,7	17,7	17,9	17,3	16,8
SEM	4,21	3,68	4,08	4,01	4,56	3,74	3,71	3,69	3,84	3,22	3,48	2,58	1,61	2,00	2,38
Mean A	24,1	24,1	23,6	23,1	23,3	23,6	23,3	22,8	23,9	23,8	23,5	23,1	24,9	25,4	26,0
SEM	4,61	3,11	4,53	3,40	3,82	3,28	3,11	4,03	4,32	4,05	4,02	3,68	5,21	4,93	5,79

AI:anesth.+injured; AB:anesth.+bled; CB:conscious bled; AIB:anesth.+injured+bled, A:anesth.

time (min)	-30	-15	-5	9	19	31	44	60	120	180	300	1440	2880	4320	5760
[illegible]															
Mean AS	542	525	515	540	510	545	512	535	537	542	544	548	585	501	532
SEM	60	109	122	148	122	142	147	144	129	128	124	73	121	183	157
Mean AB	382	360	367	371	375	386	340	355	360	368	355	319	365	369	445
SEM	49	53	77	100	104	132	89	100	95	124	87	77	128	120	112
Mean CB	486	484	483	473	486	476	488	448	438	441	423	401	425	477	480
SEM	121	139	130	111	151	125	110	114	104	139	94	98	122	169	54
Mean ASB	546	515	473	490	485	474	488	490	485	475	452	456	457	458	470
SEM	96	78	101	90	81	100	87	95	138	108	111	135	134	145	147
Mean A	555	588	515	569	595	588	584	579	563	526	512	521	533	542	562
SEM	90	95	135	136	121	99	130	90	91	120	85	92	86	99	110
[illegible]															
Mean AS	13,8	14,4	14,1	14,2	14,2	14,4	14,6	14,7	14,2	13,8	13,8	14,7	14,5	14,1	14,6
SEM	1,16	1,24	1,20	1,97	2,56	1,59	2,01	1,80	1,26	0,83	1,47	1,14	1,00	0,76	1,36
Mean AB	14,0	14,3	12,9	13,3	13,6	13,4	13,4	12,9	13,2	13,7	14,8	15,6	15,2	15,2	13,7
SEM	1,40	1,41	0,89	0,71	1,18	1,46	1,76	1,53	2,13	1,62	1,38	1,03	1,30	2,09	1,87
Mean CB	13,4	13,6	13,3	13,3	13,0	13,1	12,8	14,7	13,5	14,0	14,5	14,7	15,2	14,9	15,2
SEM	1,43	1,25	1,28	1,58	1,11	1,07	1,58	2,54	1,36	1,66	1,52	1,77	0,82	1,39	2,20
Mean ASB	13,5	14,8	14,2	14,8	14,1	14,1	14,0	14,0	14,2	14,3	14,3	14,8	14,8	14,8	15,6
SEM	2,44	1,88	1,77	2,84	2,04	2,14	2,00	2,21	1,91	1,45	1,37	2,04	1,54	2,26	1,67
Mean A	14,3	13,9	13,3	14,3	14,3	13,2	13,8	13,4	13,8	14,8	14,6	14,4	14,5	14,8	15,1
SEM	1,12	0,98	0,71	0,91	1,07	1,27	1,08	1,85	1,93	1,64	1,83	1,45	1,73	0,99	1,23
[illegible]															
Mean AS	17,2	18,4	17,0	16,3	16,3	16,3	17,7	17,3	17,6	17,9	17,5	17,2	16,8	17,1	17,7
SEM	4,06	4,93	3,17	1,97	3,09	2,71	3,04	2,76	2,88	3,24	3,64	4,73	2,39	2,05	3,62
Mean AB	15,6	15,0	15,6	15,4	16,2	16,4	16,8	16,3	16,5	16,3	16,2	16,4	19,1	19,1	16,6
SEM	2,36	1,88	1,40	1,41	1,71	1,81	2,09	2,30	3,70	2,61	1,80	2,77	2,94	3,85	4,02
Mean CB	16,1	16,1	16,1	17,1	16,2	16,7	16,3	17,5	17,4	16,2	17,9	17,1	17,2	16,9	17,5
SEM	2,36	2,30	1,49	2,16	2,32	2,19	2,40	2,84	3,21	3,47	3,15	3,11	2,51	2,66	3,09
Mean ASB	17,0	16,5	16,3	17,5	17,5	16,9	16,8	16,4	17,7	16,0	16,8	16,2	16,5	17,9	17,6
SEM	3,96	2,61	3,27	4,64	5,22	5,19	6,72	5,65	4,02	4,42	6,20	3,80	2,29	3,06	2,20
Mean A	17,9	17,4	16,9	17,3	16,8	16,5	16,1	17,4	17,2	16,2	17,8	17,3	17,8	18,1	17,9
SEM	3,39	4,20	2,63	2,74	2,76	2,57	2,58	2,60	2,81	3,57	3,29	2,85	2,16	3,10	2,78
[illegible]															
Mean AS	5,80	5,61	5,12	5,03	5,08	5,09	5,19	5,34	5,17	5,16	5,23	5,68	6,11	6,16	6,11
SEM	1,22	1,01	0,80	0,82	0,95	1,13	1,02	1,22	1,28	1,46	1,39	1,85	2,32	2,33	2,18
Mean AB	5,38	5,61	5,66	5,73	5,98	5,61	5,20	5,49	5,37	5,92	5,86	5,64	6,29	5,86	6,87
SEM	0,86	0,91	0,67	0,88	0,74	0,84	0,46	0,64	0,38	0,77	0,48	0,58	0,74	0,70	1,49
Mean CB	4,86	4,71	4,60	4,79	4,80	4,86	4,80	5,01	5,19	6,17	5,80	5,30	4,78	4,54	5,75
SEM	1,35	1,11	1,10	1,11	1,20	1,21	1,29	1,38	1,22	1,29	1,42	0,97	0,78	0,91	0,19
Mean ASB	4,73	4,23	4,08	4,23	4,23	4,28	4,80	4,52	4,80	4,12	4,28	5,75	6,31	6,13	6,40
SEM	0,67	0,74	0,93	1,10	1,14	0,98	0,93	0,85	0,97	0,89	0,86	2,19	1,67	1,72	1,84
Mean A	5,49	5,02	5,21	5,11	5,28	5,28	5,26	5,22	5,36	5,52	5,48	5,42	5,36	5,34	5,41
SEM	1,10	0,91	0,81	0,89	0,99	1,01	0,99	1,03	1,29	1,33	0,91	1,12	0,86	1,78	1,14

AI:anesth.+injured; A:anesth.+bled; CB:conscious bled; AIB:anesth+injured+bled; A:anesth.

time (min)	-30	-15	-5	9	19	31	44	60	120	180	300	1440	2880	4320	5760
[illegible]															
Mean AS	7,4854	7,4278	7,4486	7,4866	7,467	7,4854	7,4758	7,491	7,5059	7,4994	7,4945	7,513	7,4628	7,5163	7,5043
SEM	0,0282	0,0316	0,0405	0,0363	0,0382	0,0363	0,0393	0,032	0,0373	0,0329	0,0199	0,0239	0,0397	0,0199	0,0373
Mean AB	7,4844	7,4874	7,479	7,4795	7,4772	7,4822	7,484	7,47	7,4798	7,4543	7,489	7,4832	7,4823	7,4716	7,5016
SEM	0,0641	0,0617	0,0909	0,0856	0,0844	0,0718	0,0748	0,0718	0,048	0,0663	0,0628	0,0709	0,0149	0,0131	0,0379
Mean CB	7,4862	7,5044	7,4858	7,4864	7,483	7,4914	7,4862	7,5072	7,5116	7,5062	7,491	7,4824	7,5036	7,4856	7,488
SEM	0,0277	0,0228	0,0211	0,0218	0,0314	0,0317	0,0328	0,0285	0,0336	0,044	0,013	0,0424	0,0305	0,0417	0,0181
Mean ASB	7,4828	7,4884	7,4888	7,4714	7,4764	7,4864	7,488	7,478	7,4896	7,477	7,5008	7,4848	7,5034	7,4816	7,5013
SEM	0,0853	0,0838	0,0984	0,0859	0,0889	0,0846	0,089	0,0564	0,0316	0,0435	0,0274	0,0892	0,104	0,0446	0,0525
Mean A	7,4854	7,4478	7,4497	7,4648	7,4588	7,4888	7,4844	7,4727	7,4987	7,4883	7,474	7,5009	7,4801	7,4983	7,4939
SEM	0,0269	0,0478	0,0385	0,0352	0,0344	0,0478	0,0458	0,0339	0,0362	0,0311	0,0344	0,0241	0,0332	0,0256	0,0261
[illegible]															
Mean AS	7,4042	7,4018	7,412	7,413	7,4262	7,4332	7,4286	7,4288	7,4422	7,4568	7,4285	7,461	7,4595	7,4583	7,457
SEM	0,0438	0,0418	0,0383	0,0328	0,0423	0,0381	0,0397	0,0375	0,0336	0,0243	0,06	0,0141	0,0422	0,0119	0,0102
Mean AB	7,4188	7,4111	7,4414	7,44	7,3899	7,3902	7,3896	7,4172	7,4248	7,4378	7,4288	7,458	7,457	7,4413	7,4194
SEM	0,0551	0,0597	0,0875	0,0859	0,097	0,115	0,0782	0,051	0,025	0,0499	0,1023	0,0376	0,0448	0,0217	0,0095
Mean CB	7,4548	7,4488	7,45	7,44[illegible]	7,4434	7,4538	7,4336	7,4428	7,4408	7,4558	7,4389	7,4538	7,4554	7,451	7,4764
SEM	0,0348	0,0138	0,0174	0,0176	0,0236	0,0208	0,0232	0,0224	0,0234	0,0543	0,0807	0,0277	0,0196	0,0264	0,0286
Mean ASB	7,4668	7,4353	7,4538	7,4605	7,4533	7,4[illegible]6	7,4535	7,449	7,4243	7,4415	7,4835	7,4783	7,515	7,422	7,464
SEM	0,0389	0,0815	0,0748	0,0838	0,0846	0,07	0,0394	0,0487	0,0134	0,0153	0,0131	0,0886	0,0805	0,0701	0,0212
Mean A	7,4316	7,4146	7,4[illegible]0	7,4126	7,4197	7,4229	7,4153	7,4247	7,43[illegible]9	7,4631	7,4323	7,4583	7,4547	7,3803	7,4483
SEM	0,0472	0,014	0,033	0,0308	0,0409	0,0385	0,0377	0,037	0,0307	0,0256	0,0442	0,0153	0,0331	0,2518	0,0158
[illegible]															
Mean AS	99,18	85,18	98,88	91,84	93,62	95	12,88	92,8	94,16	87,34	85,5	90,05	88,275	92,125	88,1
SEM	10,994	6,3723	4,5767	2,0849	5,3944	7,8412	11,014	6,8814	4,7428	7,0285	2,7388	5,0837	12,072	8,5141	10,685
Mean AB	88,48	80,18	87,88	87,38	90,25	87,48	85,82	98,8	95,7	104,3	97,44	90,5	91,075	78,28	80,56
SEM	12,894	6,2843	9,0723	8,4063	7,8875	8,9091	8,8872	11,894	7,3686	12,322	16,253	7,847	8,148	15,135	11,387
Mean CB	91,3	98,5	93	94,88	96,56	93,02	98,4	96,5	97,35	99,02	100,02	96,38	96,2	98,82	79,84
SEM	8,8978	10,136	15,615	12,671	9,4478	10,804	12,736	14,586	13,403	28,575	23,509	10,195	16,352	14,884	11,482
Mean AIB	91,82	88	89,24	85,58	85,58	94,3	94,42	88,38	89,04	93,54	96,14	92,9	89,38	90,56	92,32
SEM	16,271	23,054	24,982	18,572	12,522	16,777	17,548	11,113	11,801	17,408	17,582	9,6283	13,786	16,656	17,936
Mean A	95,2	87,4	86,571	90,771	90,271	88,129	90,657	91,914	90,814	87,457	88,014	92,1	91,871	93,571	92,271
SEM	11,908	6,5739	7,1944	4,8472	5,8606	14,467	10,466	6,5313	6,3511	7,4808	5,1073	8,6201	9,4595	8,6938	11,444
[illegible]															
Mean AS	37,42	42,82	47,24	46,5	43,68	41,82	41,12	40,88	37,56	38,58	37,075	37,4	40,475	40,2	41,15
SEM	11,188	4,1757	6,7888	4,2282	5,1639	5,6112	6,0727	6,3278	5,7316	6,0605	6,9884	5,8212	6,5255	2,6357	3,081
Mean AB	36,48	42,14	47,28	47,12	47,22	46,9	46,8	44,32	40,28	39,14	39,58	34,32	37,5	36,7	32,18
SEM	9,4497	9,302	8,4629	8,4221	9,8884	7,1932	7,3882	9,8823	9,1418	9,6935	9,1189	6,941	6,5656	5,3722	7,8197
Mean CB	39,04	39,02	39,86	39,68	38,4	40,08	39,54	38,58	38,18	38,2	38,78	38,82	38,62	36,46	39,06
SEM	3,0443	3,1444	1,3202	2,0707	3,5066	2,4982	2,5185	1,9566	3,2784	4,6415	10,688	7,885	7,5136	6,7873	5,6884
Mean ASB	42,9	46,7	50,325	46,15	46,375	42,35	45,15	43,925	40,675	40,525	38,475	38,93	39,033	34,9	37,133
SEM	8,8246	7,0772	10,496	9,804	9,2363	9,273	7,8207	8,4088	8,1303	10,492	2,4264	9,6892	9,6837	10,25	1,914
Mean A	38,02	41,8	44,84	43,74	41,68	41,14	41,4	40,32	36,38	36,48	36,883	36,533	40	42,517	40,783
SEM	8,5894	3,1788	4,8242	4,0315	4,009	5,7921	6,478	7,2919	5,8032	5,0926	4,709	5,7892	4,88	4,2461	4,8974

AI:anesth.+injured; A:anesth.+bled; CB:conscious bled; AIB:anesth+injured+bled; A:anesth.

time (min)	-30	-15	-5	9	19	31	44	60	120	180	360	1440	2880	4320	5760
[redacted]															
Mean AS	40,16	46,48	46,7	46,3	42,9	41,48	42,48	42,36	41,06	40,14	39,05	39,05	40,575	39,825	40,775
SEM	2,4883	2,5467	3,0481	5,1911	3,8794	2,2446	2,8024	3,2377	4,4882	4,9565	4,752	1,7253	1,6701	3,9978	3,2808
Mean AB	38,58	41,82	38,42	39,14	38,2	38,94	39,32	38,84	38,14	38,22	38,74	39,16	40,3	41,7	42,06
SEM	4,3831	7,3406	2,8128	3,3716	4,5072	5,2887	5,2533	6,7002	6,4139	2,6762	6,5133	5,2815	4,6957	2,8767	3,6827
Mean CB	41,1	42,48	43,16	41,84	40,54	39,24	38,86	34,62	40,54	40,34	37,8	40,6	39,44	41,48	45,42
SEM	4,5205	4,985	6,7562	6,0663	6,6008	7,5766	5,4542	7,6845	6,9229	11,698	4,8286	3,3601	3,9329	4,202	9,5364
Mean ASB	39,26	45,04	41	40,04	40,64	39,02	39,2	39,5	38,96	38,98	35,94	39,02	38,26	43,5	41,7
SEM	2,9963	8,3972	4,7046	6,6186	6,0471	5,9831	6,046	7,1941	3,5161	1,6043	2,2412	7,9014	3,7652	3,9147	5,6651
Mean A	41,95	46,633	48,467	46,56	45,133	46,133	46,617	43,433	41,833	40,6	40,9	40,683	41,35	41,833	40,917
SEM	3,7453	1,7154	5,6479	5,9457	6,1918	7,2105	5,8301	4,2993	4,9874	4,751	4,6834	4,985	4,6089	4,7961	2,9208
[redacted]															
Mean AS	50,34	53,18	52,14	52,34	50,52	50,18	49,58	49,68	48,68	47,5	48,35	48,875	48	48,725	48,55
SEM	5,2313	3,6203	2,9982	3,1582	3,4278	4,171	3,8378	4,2046	3,9148	4,5356	4,3665	3,344	1,4808	4,1363	2,029
Mean AB	47,72	47,22	43,78	44,24	46,64	46,4	46,74	46,84	40,14	41,8	42,44	45,98	47,14	47,65	46,06
SEM	3,2152	5,0381	1,6514	1,9165	7,0131	7,4589	7,7008	6,8992	5,8196	5,9207	4,9767	4,2595	3,6984	3,1161	3,0028
Mean CB	39,04	39,02	39,58	39,66	38,4	40,08	39,54	38,58	38,16	38,2	40,74	44,16	42,6	43,26	40,58
SEM	3,0443	3,1444	1,3202	2,0707	3,5886	2,4652	2,5185	1,5585	3,2784	4,8415	11,945	11,374	6,9069	7,983	8,5022
Mean ASB	44,775	52,3	50,1	48,85	49,675	44,475	47,525	48,85	50,15	47,4	42,8	44,825	44,867	53,8	46,7
SEM	5,1383	7,7274	9,7832	9,241	8,6748	5,288	8,3123	9,425	7,1208	4,467	2,4014	8,7168	4,5214	7,4586	2,0298
Mean A	49,78	54,6	55,5	54,56	53,52	53,46	53,4	51,86	52	49,78	46,68	46,58	47,52	46,5	46,64
SEM	1,6445	3,6282	4,2977	3,4622	4,9489	4,2418	5,4223	4,2178	4,9085	4,914	4,9771	3,1647	2,1362	3,5221	4,7967
[redacted]															
Mean AS	30,38	31,02	31,64	30,84	30,24	31,14	30,88	31,02	31,16	30,8	29,025	30,275	29,325	31,825	31,375
SEM	2,5887	3,4151	3,7856	3,567	3,2016	3,2837	2,9227	3,5991	3,7157	4,0548	4,5954	3,0989	1,1147	2,9569	1,5966
Mean AB	30,68	29,44	28,54	28,52	27,84	27,38	27,46	27,46	24,98	25,6	26,44	26,84	30,475	30,12	30,4
SEM	6,8984	6,3398	6,2861	5,6344	5,5473	5,6286	5,3977	4,1198	1,2736	3,3234	3,6842	3,1928	3,6791	1,9409	1,6985
Mean CB	28,62	29,76	29,82	29,72	29,08	29,56	28,4	28,62	28,52	28,36	29,64	31,36	31,66	31,14	30,4
SEM	0,9814	0,6189	1,0589	1,6483	1,3602	1,638	2,7008	3,1941	1,0733	0,5614	1,0807	1,8295	1,2137	1,1059	3,4533
Mean ASB	29,16	30,66	29,62	29,44	28,64	28,66	28,62	28,68	28,46	27,1	28,16	28,22	30,5	31,8	31,65
SEM	2,8224	5,113	5,3364	5,8026	5,6361	5,4389	5,2389	4,3831	5,1082	2,9875	3,2122	4,6696	5,4502	1,9118	2,6862
Mean A	30,98	31,48	31,28	31,78	31,02	31,84	31,38	31,44	31,68	30,78	31,38	31,18	30,48	32,04	32,1
SEM	2,0596	2,7517	2,7815	3,7072	3,0937	2,8448	2,7781	2,8059	2,8652	3,2769	3,7225	3,3813	2,8818	2,5851	2,2034
[redacted]															
Mean AS	32,14	31,74	32,12	31,88	32,04	32,72	31,88	31,88	31,68	32,3	31,1	32,6	32,15	32,625	32,525
SEM	3,1213	3,5898	3,6816	3,9477	3,8773	3,2898	2,8416	3,2115	3,3809	3,2386	3,8773	3,2073	2,8338	2,9511	2,5708
Mean AB	29,94	30,66	28,82	28,5	28,72	28,12	27,88	28,42	26,76	26,78	29,16	31,74	33,42	31,4	31,2
SEM	6,8081	6,4048	7,1068	6,1037	5,8144	5,2958	5,3478	4,2768	1,1925	4,9494	5,4743	3,8941	4,8474	1,7283	1,5166
Mean CB	29,62	30,6	30,56	30,94	30,26	30,08	30,68	31,2	31,08	30,9	30,175	32,35	34,233	33,967	33,333
SEM	1,1628	0,9186	1,0407	1,1104	1,571	2,4814	1,5064	2,3087	1,3142	1,4	1,1177	7,8239	6,3106	2,7154	2,9838
Mean ASB	32,46	33,025	31,85	31,825	31,8	32,05	31,5	31,85	30,85	29,65	29,12	30,9	32,32	32,02	31,28
SEM	3,2419	3,9152	5,2054	5,0222	4,7979	4,7007	3,1623	3,3729	4,6751	1,0344	3,4696	3,3628	0,6797	1,0803	3,0617
Mean A	33,92	33,84	34,36	34,22	34,1	33,9	33,32	33,56	34,16	33,84	32,66	34,02	33,26	32,907	33,4
SEM	2,8244	3,2929	3,3374	3,0567	3,0725	3,1201	2,6291	3,0947	3,2478	3,3095	3,6894	2,9877	2,3234	2,7197	2,4566

A:anesth.+injured; AB:anesth.+bled; CB:conscious bled; AB:anesth.+injured+bled; A:anesth

Time (min)	-30	-15	-5	5	15	31	44	60	120	180	300	1440	2880	4320	5760
[illegible]															
Mean S	7,38	6,85	7,15	7,25	7,48	8,04	7,1	7,08	7,48	7,66	8,48	7,98	7,72	7,94	7
SEM	3,5171	4,0991	4,1873	3,681	3,0327	3,4567	2,8027	3,6456	3,4225	3,1444	3,4825	2,6004	2,6666	2,4674	1,8385
Mean AB	5,94	6,48	6,34	6,76	4,22	3,86	5,52	4,42	1,82	0,06	5,86	7,66	9,26	7,02	7,18
SEM	6,76	8,331	7,7881	6,5256	6,0362	5,1184	5,6316	4,2756	3,0824	5,7413	5,5527	4,1675	4,695	1,9254	1,2853
Mean CB	8	6,86	6,86	7,14	6,74	5,24	6,74	7,3	7,2	7,24	7,52	7,76	8,54	8,22	7,66
SEM	0,000	0,8872	0,8946	0,8864	1,2816	3,1081	1,4707	2,0082	1,2306	1,2834	0,8258	1,8804	0,8661	0,5404	2,7916
Mean AB	8,56	8,86	8	8,1	7,825	8,4	7,8887	7,725	6,375	5,45	8,425	8,875	12,267	8,5	10,867
SEM	3,3718	4,9537	5,6374	10,041	5,4701	5,0829	4,8725	3,357	4,5331	1,601	0,8016	6,2829	5,3003	3,3867	1,5373
Mean A	8,5	10,5	10,5	10,6	9,6	8,7	9	9,1	10,3	10,5	10,3	10,3	10,5	10	10,1
SEM	0,5657	0,5657	0,7071	2,2627	1,2728	2,1213	1,4142	1,8971	0,7071	0,7071	0,825	0,804	1,12	1,06	0,964